Sustainable Poverty Alleviation from Coastal Ecosystem Services
SPACES
espa ecosystem services for poverty alleviation

SPACES Working Paper Series
No: 007 / November 2017

Fisheries and mangrove pole value chains in Kenya: A comparative analysis across fisheries and sites

August 2017

Compiled by: Christopher Cheupe, Ashleigh Arton, Beatrice Crona

Contributed by: Andrew Wamukota, Christopher Cheupe, Innocent Mulwodo, Stephen Wanyonyi and Rosebelle Apamo collected semi structured interviews with market actors. Matilda Thyresson and Tim Daw provided guidance on fieldwork.

This working paper results from the project 'Sustainable Poverty Alleviation from Coastal Ecosystem Services (SPACES) NE-K010484-1' funded with support from the Ecosystem Services for Poverty Alleviation (ESPA) programme. The ESPA programme is funded by the Department for International Development (DFID), the Economic and Social Research Council (ESRC) and the Natural Environment Research Council (NERC).

Table of Contents

Introduction

This working paper synthesizes results from value chain mapping of four types of commodities (octopus, small pelagics, mixed reef fish and mangrove pole) across four sites in Coastal Kenya (Jimbo/ Vanga, Tsunza, Kongowea and Mkwiro/Shimoni). Data was collected within the SPACES project, by the SPACES field team in Kenya from 28th November 2014 to 31st January 2015. It draws on information from the site reports from the four sites and outlines the maps of the fisheries and mangroves pole value chains in each site. Each value chain is characterized with respect to number and types of actors involved and a comparative analysis is conducted of value chain characteristics and complexity across fisheries and sites.

Methodological note

An explanation of the proxies for complexity used in the comparison of value chains in Kenya.

In order to compare the complexity of the different value chains in Kenya, two proxies were created. The first sums the number of pathways the products (mixed reef fish, small pelagic fish, octopus or mangrove poles) could travel along before arriving at the end point or final consumer (indicated in green in the maps). The second looks at the number of nodes the products pass through before arriving at the end point.

To calculate the first proxy the number of pathways per end point were counted. Note that fishers were seen as a starting point and thus each fisher node was not counted as a separate path for the products.

To calculate the second proxy the number of nodes was simply counted for each end point, across all pathways. The end point itself is excluded in the count but the starting node (i.e.

fishers) is included. Note that the fishers were counted as one node and not counted separately according to their gear or vessel combinations. For each point the number of nodes was noted and the median taken to provide an overall complexity value.

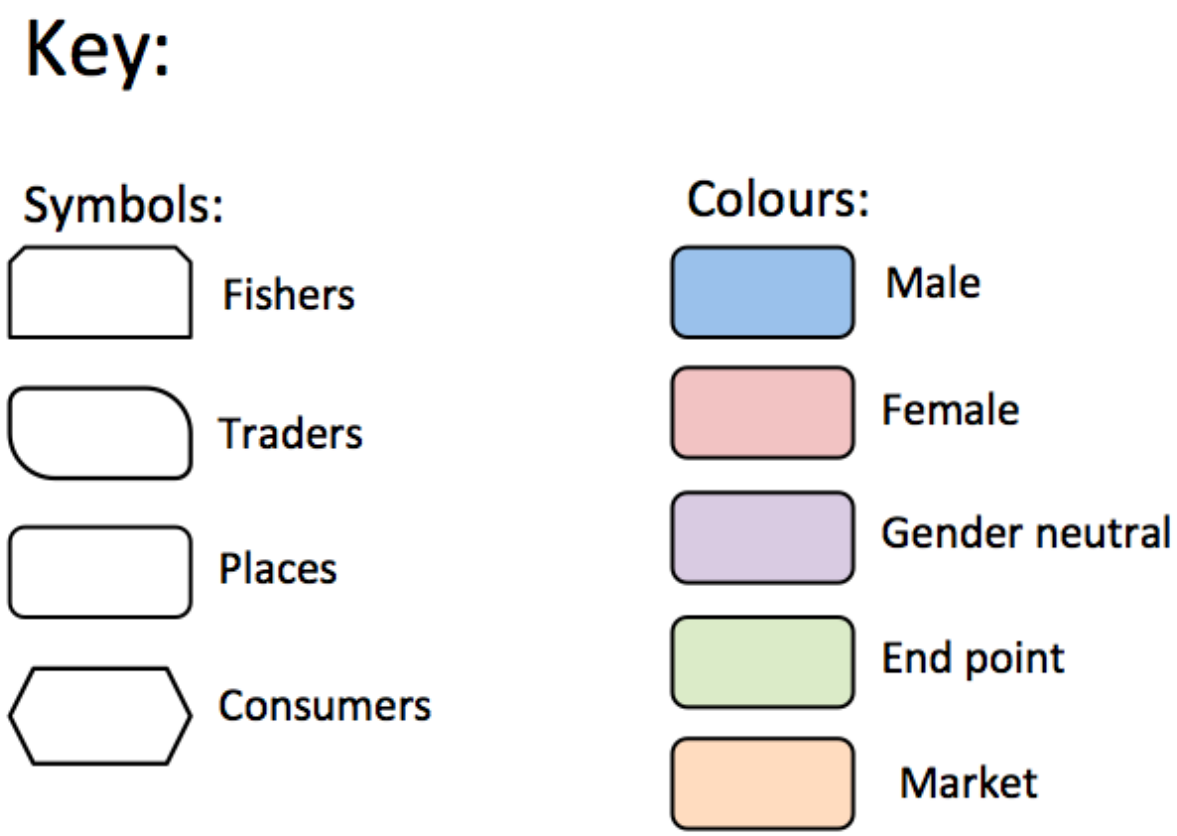
To illustrate:

In Kongowea Octopus Value Chain there are three end points (low-income consumers, middle-income consumers, high-income consumers), see figure below.

Starting at low-income consumers one can see there are two pathways available, one in which the fish comes directly from the small-scale female traders and one where it passes through food kiosks and small-scale male traders. Thus fish traveling from the fishers to the end point 'low-income consumers' has two possible pathways. 'Middle-income consumers' and 'high-income consumers' also have two pathways, one going through fish shops and the other through restaurants or restaurants and tourist hotels. Thus we have values of 2,2,2. The median of which is 2.

To calculate the second proxy for Kongowea one can see for 'low-income consumers' there is either two nodes or three nodes before the end point and for 'middle-income consumers' and 'high-income consumers' there are three nodes (fish shops, small-scale male traders and the fishers).Thus we have values of 2,3,3,3,3,3, the median of which is 3.

A key for the value chain maps used



Jimbo

Jimbo is a small village in Vanga location in Kwale county of Kenya. The area is termed as a fishing village as most of livelihood activities depend on fishing. For the past 3 years dagaa fishing has taken root apart from mixed reef fishing. Both male and female are actively involved in dagaa trading.

Here, Dagaa was the commodity investigated. It was realized that, there are different grades of the dagaa recognized by both dagaa traders and fishers. Processing mode (boil then dry or dry without boiling), Size, species and taste are the main characteristics of Dagaa grades.

The three Dagaa grades are:

- **Kimarawali (*Spratellomorpha bianalis)*** which has greenish lines and are small in size with body a little compressed, Belly rounded and it's head remain intact after processing. Normally dried without boiling. It also dries quickly.
- **Simsim (*Sardinella melanura)*** are big in size compared to the other two types. Belly with a sharp keel. It takes long time to dry.
- **Kata shingo/ngongongo (*Sardinella neglecta)***: are white in colour and are small but bigger than Kimarawali with Predorsal scales paired and overlapping. Its head breaks during processing. Dry quickly.

Key informant interviews and survey with fishers and traders were conducted.

Interview Participants

The respondents were both dagaa fishers and traders.

Fishers

Ring net is the main gear used for dagaa fishing and in the process, cornet, squids etc are caught as by catch. They normal sell raw dagaa to Traders (**Wachemshaji** *meaning people who boil*) in Jimbo and sometimes to Jasini i.e when having a surplus.

There are 2 community boats with between 15 – 27 fishers per boat but according to the BMU records, only 48 dagaa fishers were registered.

Prices of dagaa are neither determined by sizes nor grade rather than Tenga (50kg). 1 Tenga of Dagaa costs between Kshs. 3500-5000 during Kusi and 1000-3500 during Kazikazi. In most cases the tenga of dagaa could be a mixture of all the 3 species/grades

There is price fluctuation due to season, demand, quantity of catch or weather.

Traders

There are two types of traders buying dagaa in Jimbo namely: Wachemshaji and Wachuuzi. Wachemshaji buy unprocessed dagaa from fishers while Wachuuzi buy processed dagaa from Wachemshaji.

Wachemshaji

There are more than 50 Wachemshaji, but according to BMU records a total of 68 Wachemshaji were registered. They buy dagaa from fishers at Jimbo landing site. Mainly, they buy from fishers from Jimbo. Sometimes fishers from Jasini, Vanga and Majoreni come to Jimbo to sell dagaa to Wachemshaji when they had surplus.

They process the dagaa and sell them to Wachuuzi. The processing stages include:

a. Sorting out into species/grades
b. Washing
c. Boiling and salting
d. Drying
e. Winnowing
f. Weighing and packaging.

After processing, they sell dagaa to Wachuuzi and some are exported to Tanzania and DRC. The un boiled and unsalted dagaa species (**Kimarawali (*Spratellomorpha bianalis)***) are sold in Democratic Republic of Congo (D.R.C.) are also sold in Tanzania as well.

The salted and boiled dagaa (**Simsim (*Sardinella melanura)*** and **Kata shingo/ngongongo (*Sardinella neglecta***) are sold in Kenyan coastal regions.

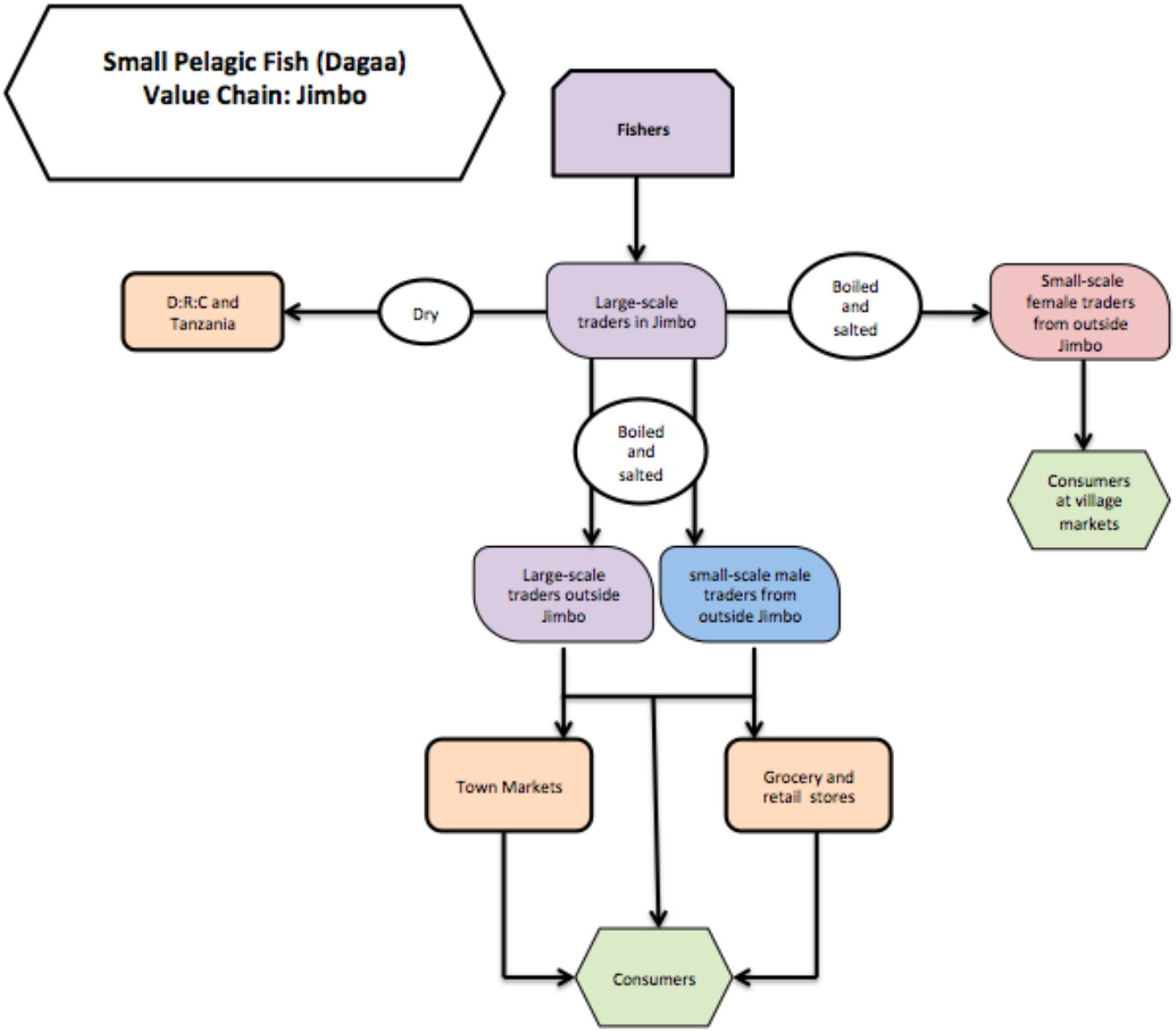
Wachuuzi

Wachemshaji sell to Wachuuzi who come to Jimbo to buy processed dagaa. There are more than 40 wachuuzi but between 5-6 Wachuuzi come to buy dagaa on a typical day. They come with own or hired motorbikes or bicycles to buy dagaa species of their choice and sell to their home villages along the Kenyan coastal regions.

Complexity proxies:

Median number of nodes: 3

Median number of pathways: 2,5


Small Pelagic Fish (Dagaa)
Value Chain: Jimbo
Fishers
Large-scale traders in Jimbo
Dry
D:R:C and Tanzania
Boiled and salted
Small-scale female traders from outside Jimbo
Consumers at village markets
Boiled and salted
Large-scale traders outside Jimbo
small-scale male traders from outside Jimbo
Town Markets
Grocery and retail stores
Consumers

Kongowea

Kongowea is urban based site in Mombasa. Several livelihood activities are conducted by people in this apart from fishing. There are 3 major landing sites namely Reef, Nyali and Mkomani. All of these landing sites are under one BMU; Nyali-Reef. There are lots of buying and selling of fish going on in these landing sites involved by both male and female.

There are different grades of the mixed reef fish recognized by both traders and fishers at this site. The fish grades are mainly determined by market value, size, taste and species. These grades are small and large mixed reef fish.

Small grade are simple because of its size i.e. all small types of mixed reef fish including surgeon, convict surgeon and parrot. Small size fish less than 0.5kg of which they have low market value as mainly bought by mama karanga.

Big/large grade these are big mixed reef fish and are mostly determined by size, species, taste and market value. Examples includes emperor variegated, rabbit fish, trevally, red snapper, white snappers, king fish, rock cod amongst others. Big size fish more than 1kg with higher market value mainly bought by Wachuuzi.

There is no grading as far as octopus is concerned. Pricing is only determined by mass not size.

Both key informant and survey with fishers and traders were conducted to collect data at this site

Value Chains

2 commodities were investigated at this site. These are mixed reef fish and octopus

Mixed Reef Value Chain

The respondents were both fishers and traders.

Fishers

Main gears used by fishers at the 3 landing sites include beach seine, monofilament gill nets, tram net and spear guns. Main fishing vessels include dug out and outrigger canoes powered by sail and paddles.

At Mkomani/English point landing site, there are around 25 fishers. At Nyali landing site, there are more than 100 fishers while at Reef landing site, there are around 155 fishers.

Fishers mainly sell to Wachuuzi (male small scale traders) and Mama Karanga (female small scale traders). In addition to, fishers sell to low income consumer, food kiosk and fish shop but here, a limited portion goes via this channels.

Traders

There are two major categories of small scale traders in the area; female fish traders and male fish traders. Female fish traders are commonly known as 'Mama Karanga' because they fry fish before selling to their customers while the male traders are known as **Wachuuzi**

a. **Female traders (mama karanga)**

Mama Karanga buys fish from fishers and from fish shops only when they miss fish at the landing site. They sell fried fish to consumer in their residential areas i.e. Kisauni, Bombolulu, Bamburi, Shanzu, kongowea.

Mama karanga process fish before selling to their customers i.e. descaling, gutting, washing, salting, cutting into pieces and frying.

There are 5 Mama karanga who buy fish at Mkomani/English point landing site, around 40 at Nyali landing site and around 35 at Reef landing site.

b. **Male traders (Wachuuzi)**

Wachuuzi usually buy fish from fishers at the landing site. Some rarely buy from large scale fish traders at Majengo market in Mombasa. These large-scale fish traders get the fish from trawlers. They sell fish to fish shops, final consumers, hotel and restaurant

They transport fish using bicycles, motor bike taxis and matatu. They use bicycles when doing door to door hawking in the residential estate in Kisauni & Bombolulu and motor bike or

matatu when delivering orders to hotels, restaurants and fish shops in Mtwapa and Mombasa.

Wachuuzi sell raw fish to their customers but at times they process upon request at a certain fee. They sell unprocessed fish because descaling and gutting reduces the weight of the fish hence low profit.

There are 8 male traders in Reef landing site, around 15 in Nyali landing site and around 8 Mkomani/English point landing site.

Fish shops

These are shops that usually buy fish from male small scale traders and fishers in large quantity and have storage facilities. They are termed large scale because they buy fish in bulk from different sources. They sell fish to the local residents and supply to tourist hotels and restaurants and also to Mama Karanga when they miss to get catch from fishers.

There are 2 fish shops in Bombolulu, 5 in Kisauni, 3 in Bamburi, 1 in Shanzu, 1 in Kengeleni and 20 in Majengo in Mombasa town.

Food kiosks

Food Kiosks are located adjacent to the beach and within residential areas. They buy fish from fishers and sell to their customer mainly low income earners. There are around 6 food kiosks in Nyali landing sites.

Restaurants

Restaurants located within the site and out of the site including Mombasa and Mtwapa. Restaurants also get fish supply from fishers, male small scale traders and fish shops. They usually buy by placing an order to be supplied daily or after certain number of days. They cook fish before selling to their customers

Tourist hotels normally beach hotels which got constant supply of fish from male traders and fish shops are Tamarind dhow, Mombasa beach, Korogo Hotel, Bahari beach Hotel, Nyali beach and Reef beach hotel. They cook and sell to their customers

Consumers

There are of two types: regular and opportunist. Regular consumers buy from the same node daily while opportunistic consumers usual come as by the way. Consumer can either be tourists or residents. They are classified as low income earners, middle income earners and high income earners. Others buy raw fish while others buy processed fish depending on which node they buy from. They also cook or buy cooked fish. Consumers are within the site and also in Mombasa, Shanzu and Mtwapa.

Complexity proxies:

Median number of nodes: 3

Median number of pathways: 6

Octopus Value Chain

The respondents were both fishers and traders.

Fishers

Spear gun and spears are the main gears used for catching octopus. Fishers sell octopus mainly to mama karanga (small scale female traders) and wachuuzi (small scale male traders) at the landing sites.

Fishermen process octopus by removing ink, hitting them using sticks or hitting them on the beach before selling to traders of different kinds.

They put the octopus in polythene bags and mainly use public transport and sometimes motorbike taxis when the octopus is urgently needed to customer who is far away from the landing site and they need them while still fresh. This is usually to customers who have ordered in Mtwapa.

Traders

Both male and female traders buy octopus from fishers.

The **male traders** sell the raw octopuses to fish shops, Hotels, restaurants and to food Kiosks.

The **female traders** process by hitting to make it tender, removing ink, washing, boiling, cutting into pieces and frying octopus before selling to consumers in their residential areas i.e. Bombolulu, Kisauni, Bamburi and Shanzu.

They use motorbike taxi commonly known as ‘Bodaboda’ or a minibus commonly known as ‘matatu’ to transport octopus to their customers.

Hotels

Small sale male traders sell octopus to tourist hotels and restaurants in Mombasa and Mtwapa.

These hotels usually cook octopus and sell them to their consumers.

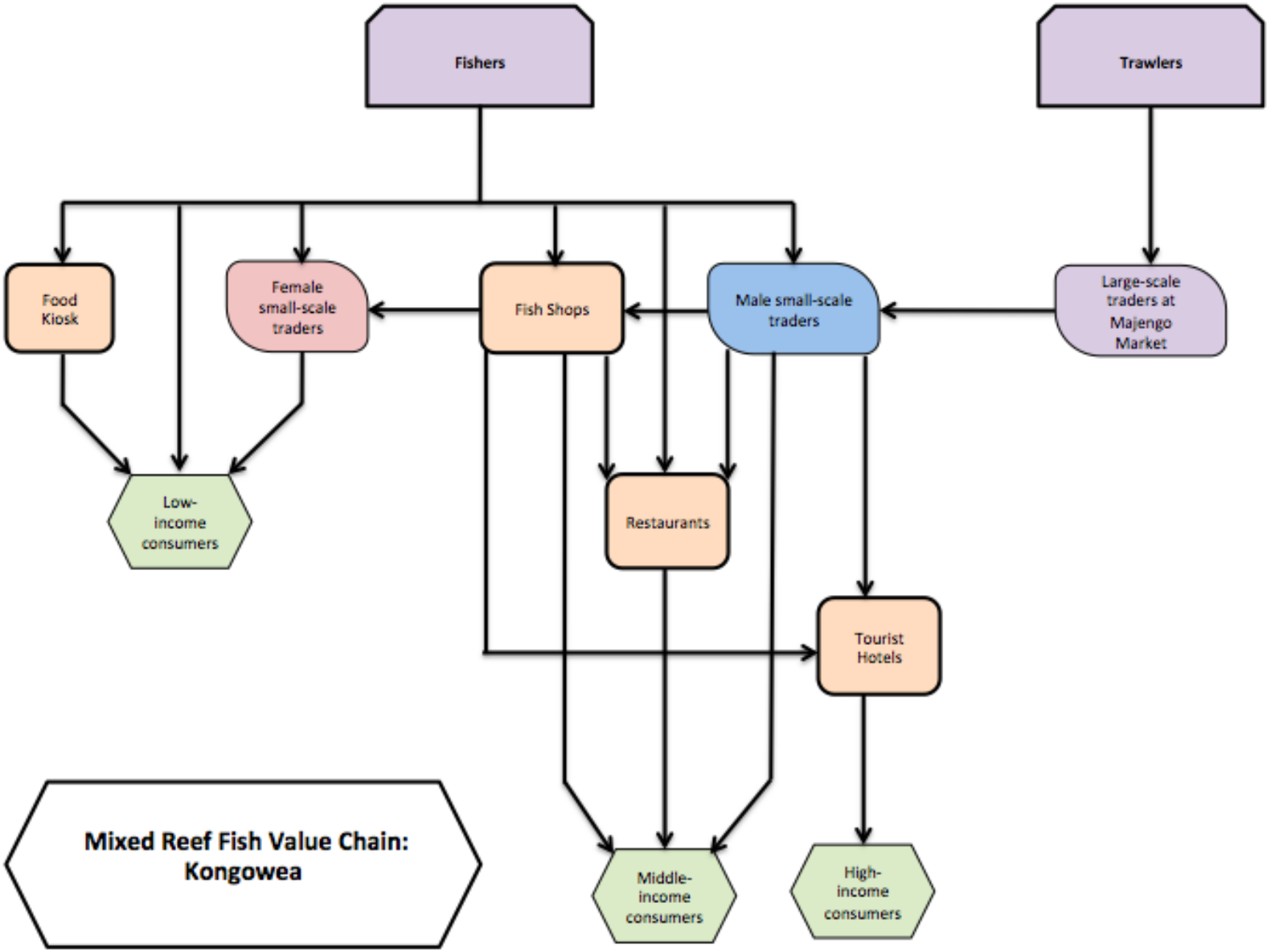
Consumers

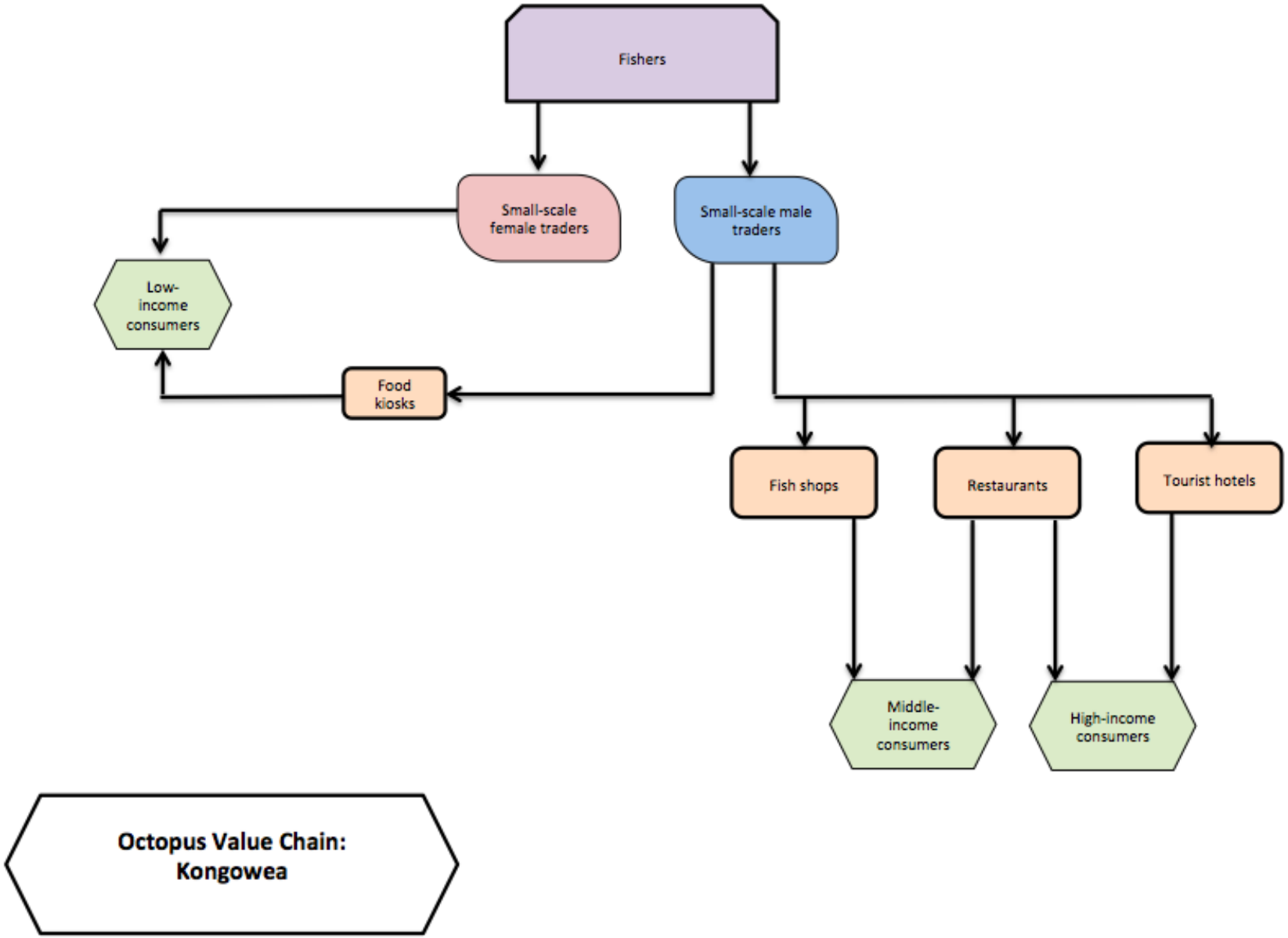
They buy octopus from fishermen, traders, fish shops and hotels. There are two types of consumers, regular and opportunistic. Regular consumers usually buy from the same seller or through placing an order while opportunistic consumers buy from different sellers when they come across the product. Octopus consumers come from Bombolulu, Kisauni, Bamburi, Shanzu and Mtwapa.

Low income consumers buy from food kiosks or from mama karanga who cut into pieces and fry the octopus. Middle income consumers buy from male fish traders or from fish shops while high income consumers buy from fish shops when raw and from hotels when cooked.

Median number of nodes: 3

Median number of pathways: 2


Fishers
Trawlers
Food Kiosk
Female small-scale traders
Fish Shops
Male small-scale traders
Large-scale traders at Majengo Market
Low-income consumers
Restaurants
Tourist Hotels
Middle-income consumers
High-income consumers
Mixed Reef Fish Value Chain: Kongowea


Fishers
Small-scale female traders
Small-scale male traders
Low-income consumers
Food kiosks
Fish shops
Restaurants
Tourist hotels
Middle-income consumers
High-income consumers
Octopus Value Chain: Kongowea

Tsunza

Tsunza peninsular is located in Kwale County. In this site 4 villages were mapped out including Tsunza central, Mkunguni, Mikanjuni A and Mikanjuni B. The area is surrounded by mangrove. Peasant farming and fishing are the main livelihood activities sustaining the lives of the villagers

Machete, axe and saw are the main tools used for harvesting mangrove poles. Dugout canoe are also very important in accomplishing this exercise as they are used for accessing to deep inside the mangroves forest and to transport poles to the main land. In addition to, transport poles to consumers.

Both key informant interviews and survey were conducted with both pole cutters and traders at this site.

Value Chains

Respondents were both male and female pole cutter and traders.

Mangrove pole value chain:

1. **Pole cutters**

All pole cutters interviewed were from Duruma ethnic group and are within the age range of 26yrs to 61yrs.

Pole cutters are involved in cutting poles from mangroves. They also process poles before selling to their customers i.e. trimming and logging. Poles for firewood are logged into smaller pieces about one metre while for construction are logged basing on the specifications of the buyer. They also process by leaving poles fully or partially submerged in ocean for 2 – 3 days after cutting them to make them strong enough for construction. For firewood they are dried on the sun.

Pole cutters transport their poles using canoes from mangrove forest to sea shores where they are stored until they accumulate to the required number by the buyer. Then they are carried on the shoulder or on the head to villages or put into canoes and transported across the ocean to Mkupe (sea shore bordering Tsunza and Miritini) if they are needed by the agents.

There are two types of pole cutters namely freelance and contractors.

Freelance pole cutters

There are male and female pole cutters in this node. Respondents could not give an estimate of numbers since cutting poles requires legal authorization. Respondents claimed that freelance pole cutters do it in secrecy.

a. ***Freelance male pole cutters*** normally cut poles for the local residents in Tsunza for construction. Sometimes they are also used by the agents to cut poles for them when need arise to meet the demand for the poles market. Therefore they cut pole for firewood (un dried) to be sold to the agents and for construction to be sold to the local residents. They process by trimming and logging before they sell poles to their respective buyers.

b. ***Freelance female pole cutters*** normally cut poles for firewood. They also act as traders as they sell firewood in Tsunza, Miritini and Magongo.
They process the poles by cutting them into small logs or splitting them into pieces then dry them on the sun. Thereafter they tie them into bundles and transport them to Miritini to find customers e.g kiosk selling firewood or to any customer in Miritini

Contracted pole cutters

They work for specific agents who have legal authorization. Respondents confirmed that there are 10 contracted pole cutters.
They are paid by their agent. They also secretly cut for their own use and to Tsunza residents at fee upon request. They cut firewood for the agents and construction poles for the locals

2. **Agents**

There are four agents dealing in mangrove pole trading in Tsunza. These agents only deal in poles for firewood and not construction of permanent structures as poles for such structure are no longer found in Tsunza. Poles for constructing semi-permanent houses are available in Tsunza thus sometimes agents get orders to supply such pole to individual to build such houses in Miritini, Magongo and Changamwe in Mombasa County

They have legal entity to carry out this exercise and renew annual license at a fee of kshs. 30,000. The agents are large scale traders who look for firewood on order from firewood traders and individual customers mostly in Mombasa areas of Majengo, Tononoka, MwembeTayari , Magongo, Changamwe among other places. They also sell to industries/factories in areas like Miritini, Mazeras and kaloleni e.g. Pwani oil limited and Kanji limited (a firm that uses firewood in kilns to make construction bricks). They usually buy mangrove poles from their contractors or at times from freelance male pole cutters.

They transport the poles using pick up, canters, Lorries and Trucks to their customers from Miritini to customers' destinations. The costs incurred by agents are:

a. Transport costs are up to kshs. 5000 from Tsunza to Mombasa.
b. Transport costs per trip from mangrove forest to the shore @ 600 per 1 full canoe. At times they transport up to 30 canoes.
c. 20 poles agent buy from pole cutter @ 80. A bundle of poles is called *Korija* which has 20 poles.

Pwani oil and Kanji buy firewood from agents while direct customers buy poles for constructing their semi-permanent houses and also for firewood in Miritini, Magongo and Changamwe in Mombasa County. They also sell firewood to direct consumers who have ceremonies like weddings.

Agents do not process mangrove poles. Processing is done by pole cutters.

3. Firewood traders

Respondents said that some traders have kiosks where they sell firewood and others sell to customers in an open place or from their homes in Miritini. Poles for firewood are sold to firewood traders and individual customers both domestic users and food kiosks traders.

They buy mangrove firewood from female pole cutters from Tsunza specialized in cutting poles for firewood who carry the firewood on their heads and sell to the traders at their Kiosks.

There are about 15 firewood kiosks in Miritini. Apart from firewood they also sell other products i.e charcoal, food stuffs e.t.c.

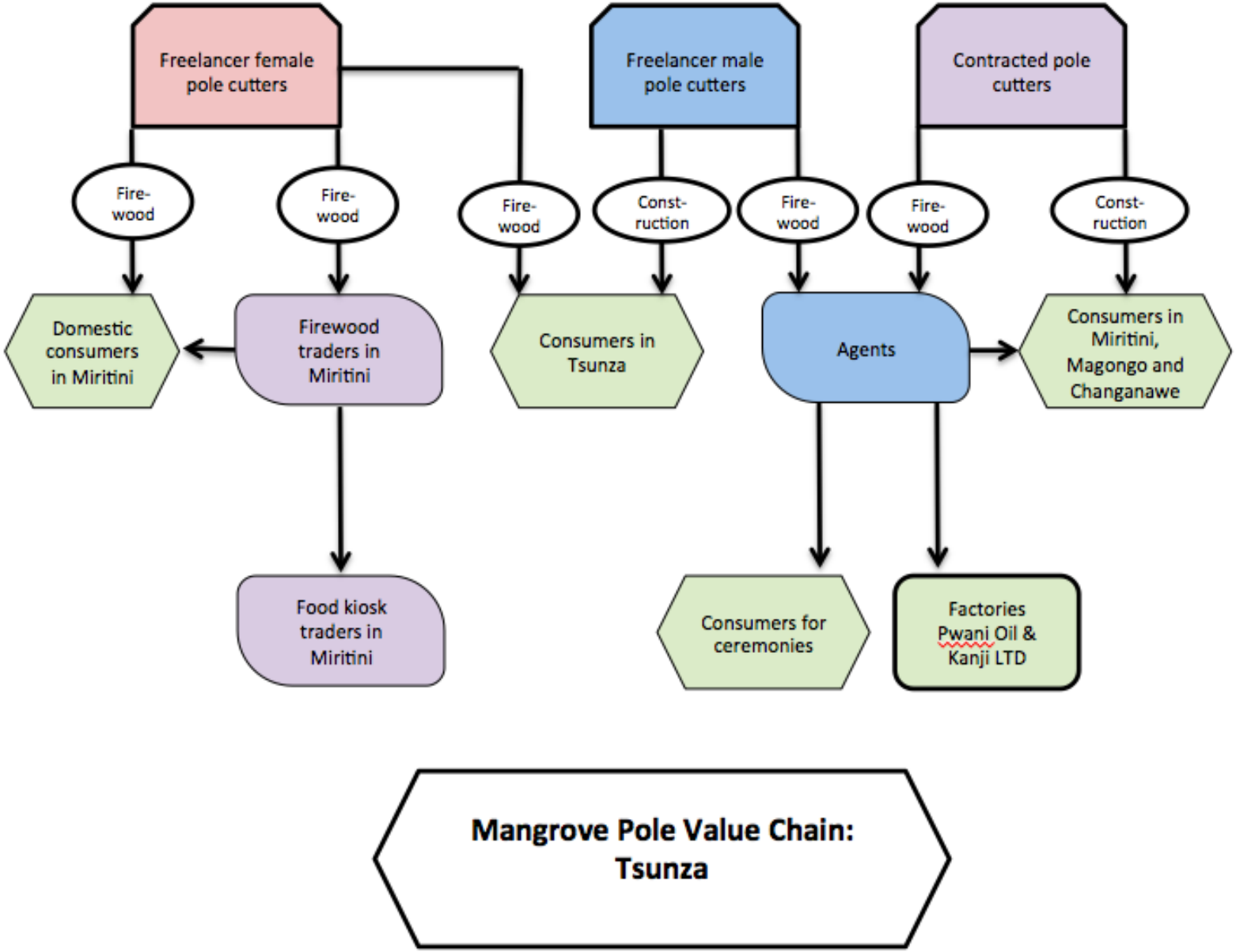
Firewood traders don't process firewood as the firewood has already been processed by the female pole cutters who sell to them e.g. splitting them into smaller pieces.

The firewood traders do not transport the firewood as the female pole cutters visit their kiosks

Complexity proxies:

Median number of nodes: 2

Median number of pathways: 2


Freelancer female pole cutters
Freelancer male pole cutters
Contracted pole cutters
Fire-wood
Fire-wood
Fire-wood
Const-ruction
Fire-wood
Fire-wood
Const-ruction
Domestic consumers in Miritini
Firewood traders in Miritini
Consumers in Tsunza
Agents
Consumers in Miritini, Magongo and Changanawe
Food kiosk traders in Miritini
Consumers for ceremonies
Factories Pwani Oil & Kanji LTD
Mangrove Pole Value Chain: Tsunza

Vanga

Vanga is termed as a fishing village as most of its residents depend on fishing activities as their main economic activity. It is located on the south coast of Kenya bordering Tanzania. It is almost surrounded by mangrove forest.
Here poles, octopus and mixed reef fish were the commodities investigated.

There are different grades of the mixed reef fish recognized by both traders and fishers at this site. The fish grades are mainly determined by market value, size, taste and species. These grades are small and large mixed reef fish. Large mixed reef fish is further sub divided into two groups: mixed grade A and mixed grade B.
Small grade are simple because of its size i.e. all small types of mixed reef fish including tuna, fusilier, cornet, purse mouth etc. Black spot snapper, emperor black spot and half beak are also considered to be in this category no matter of their size.
Mixed grade A are mostly determined by size, species, taste and market value. Examples includes emperor variegated, rabbit fish, trevally, red snapper amongst others.
Mixed grade B are mostly determined by size, species, taste and market value. Examples include Ray fish, parrot, and rock cod/groupers amongst others.

There is no grading as far octopuses are concern. Pricing is only determined by mass not size.

Vanga is also almost surrounded by mangrove forest. Most activities here involved mangrove products in one way or the other ranging from boat making, house construction/building, making fence traps, collecting firewood to furniture making.
A bundle of poles is locally called ***Korija*** and a bundle of construction poles has 20 poles while that of firewood has 7 - 8 poles.

For boat building poles, cutters go for specific species and parts. These parts are used for making boat ribs.
For construction pole cutters also go for different size including in terms of length and thickness.

For firewood, they go for the dry poles and the left over by boat and construction pole cutters

Both key informant interviews and survey were conducted.

Value Chain

3 commodities were investigated are octopus, mixed reef fish and mangroves pole. The respondents were both fishers and traders without forgetting pole cutters.

Mangrove Pole Value Chain

Pole cutters

There are male and female pole cutters. Male pole cutters mainly cut poles for construction of semi-permanent houses and boats and sometimes for firewood while female pole cutters cut poles only for firewood. They both cut poles for sell and for home use.

Since Mangroves pole cutting is illegal, one needs to obtain a temporary permit from forestry office in Vanga whereby a fee is charged (Kshs. 500) for one to have an access to the mangroves forest.

Pole cutters here also act as traders as they sell direct to consumers who have specific use in a certain areas. The pole cutters mainly sell the mangrove poles on order for constructing houses in Vanga and boats construction in Vanga and Tanzania areas like Pemba, Tanga and Zanzibar. During occasions i.e. wedding, funerals or Muslim celebrations then pole cutters, get orders from individuals who need firewood.

Poles for firewood are rarely sold to firewood traders but mostly to individual customers both domestic users and food kiosks traders.

Male pole cutters deliver poles at the shore by a canoe and the consumer organizes how to transport the poles to where they are needed mainly by hiring a hand-cart or rarely use porters to carry on their shoulders or heads to the village.

Female pole cutters tie the firewood poles with a sisal rope or piece of clothes and carry the firewood on their heads to the village where they sell it from their homes.

Pole cutters usually cut poles deep inside the mangrove forests as this is where there are mature trees. The areas poles are cut include Majoreni, Ngoa, kisiwa cha sia, Vijito vingi, Mkokani, Kikoani and in Bazo.

Pole cutters process mangrove poles by trimming and logging to the required size by the customer. Poles for firewood are also split into pieces.

The commonly known male pole cutters are 11. Four are specialized in cutting poles for boat making and seven specialized in cutting poles for house constructions and firewood, but there is a larger number of people cutting poles either for own use as building materials or firewood.

Female pole cutters are around 30 and usually work with their children and they are specialized in cutting poles for firewood.

Com Complexity proxies

Median number of nodes: 1

Median number of pathways: 1

Mixed Reef Value Chain

Fishers

Here, fishers sell fish to fish dealers (Tajiris) and to the Auction at Vanga fish market at the landing site. They normally sell to Tajiri since most of gears are owned by them (Tajiris) thus a limited portion of the fish goes via the auction. It is because of contractual arrangements; each fisher is tied to specific Tajiris whom they sell fish to. In rare cases they sell to final consumers and to Mama Karanga. This is normally done by the kind of fishers own their fishing gears.

Fishers sell their catch to fish dealers offering different price per grade and per the agreement.

When sold to the auction, fish are normally sold to the highest bidder, therefore price vary with demand, weather and whether it's a night or day catch. In addition to, when sold to the final consumer or to Mama karanga, prices also vary with demand, weather and quantity of catch.

Respondents claimed that, there are around 400 mixed reef fishers but based on BMU records, there are 409 mixed reef fishers, 5 Crabs fishers and 57 octopus fishers registered. Although there are many fishers in the categories not registered under the BMU.

1. **Fish Traders**

There are both large scale traders (Tajiri) and small scale traders (Wachuuzi and mama karangas) at this site. In addition to fish auctioning is done at this site.

a. Large scale fish dealers (Tajiri)

Tajiri buy fish from fishers from vanga and from small scale traders (Wachuuzi/madila wadogo) from jimbo and jasini. There are around 7 Tajiris in Vanga. They own boats and gears and give them to fishers who sell fish to them.
The large-scale fish traders (Tajiri) sell fish to consumers in Vanga, Wachuuzi, Mama karanga in Vanga and outside Vanga and to fish shops in Mombasa.

b. Small scale fish traders

They are of two categories namely small scale male traders (Wachuuzi/madila wadogo) and female traders (Mama karangas)

1. **Wachuuzi/madila wadogo**

There are more than 30 Wachuuzi buying fish from Auction or from Tajiris daily. They sell unprocessed fish. Some only goes to buy from the Tajiris if misses from the Auction while others just buy from Tajiri since there is a constant supply of fish.
With their bicycle or motor bike, they ride around their home villages normally outside Vanga to sell fish direct to final consumers and rarely to Mama karanga. They pile the small fish in a group of 5 or 10 for kshs 100. Here selling price vary with size and demand.
Kindly note that, there are more than 4 wachuuzi/madila wadogo from Jimbo and Jasini who sell fish to Tajiris in Vanga.

2. Mama Karangas

There are more than 15 mama karanga from Vanga and around 5 mama Karangas from Tanzania. Those from Vanga, Some own food café while others do not and they mostly buy fish from Tajiri and rarely from fishers while those from Tanzania buy from either Tajiri or from Auction but not from fishers. They mainly buy fish of small grade at Kshs. 150 per kg from fish traders. The buying price change with demand, weather and quantity of catch. Mama karangas from Vanga sell fish to final consumers in Vanga in either inside their food café served with other food or outside major retail shops after processing and frying them. While

Mama Karanga from Tanzania sell to final consumers in their home villages too. The processing stages involve descaling, gutting, cut into different pieces depending on the needs of the consumers, salting, frying and then sell the fish to low and middle income earners.

1. **Auction**

There is one Auction in Vanga site. Here fish are sold on behalf of the fisher to the highest bidder in Vanga. Wachuuzi from outside Vanga and mama karanga from Tanzania come to buy. Normally the Auctioneers uses a10 or 20kg bucket and traders express their bids

The Auctioneer sells fish on behalf fishers. Fishers pay him as certain agree amount, 400 – 500kg of catch/fish could be handled daily. Fish prices vary with the quantity between day and night. Night fishing lower price due to high catch and day fishing leads to high price due to low catch.

Complexity proxies

Median number of nodes: 3

Median number of pathways: 7

Octopus Value Chain

Fishers

It was quite challenging to get octopus fishers as most of them are using spears or spear guns which are termed as illegal gears. Others use octopus hook which is legal.

There are two major boats used for fishing octopuses, a big planked wood boat and a fibre glass boat. The planked wood boat is used by fishers who dive to get the octopus in the deep sea. The fishers use oxygen cylinders to dive and catch fish using hand-made spear guns. The fibre glass boat is used by fishers who fish at the reef using spears about 1 metre long which has a hooked end to easily get octopus from the reefs.

The respondent claimed that there are 60 fishers in Vanga catching octopuses but based on BMU records, 57 octopus fishers were registered. They are specialized in catching octopuses but in the process they sometimes catch lobsters, sea cucumbers, ray fish, variegated emperor and grouper fish. Others use ring nets to catch octopus as a by catch but they are mainly targeting other kinds of fish like parrot fish, unicorn fish, emperor variegated, rabbit fish among others.

Octopus fishers sell mostly to large-scale fish traders (dealers or agents) who have collection points at the Vanga landing and to small-scale fish traders at the Vanga fish market. They also sell to consumers in the village if they have any not bought by the fish traders. They also take some for home consumption

The reason why fishers sell to large-scale traders' is, these traders acts as Agents to Octopus dealing companies namely SEA HARVEST and TRANS-AFRIC. Since these traders have mandate over boats and fishing gears owned by the companies but used by the fishermen, they employ fishers to catch octopus for them. They also sell to small-scale fish traders as they are a ready market and buy even small or young octopus (less than 1kg).

Fishers are also provided with special cooler boxes to store octopus when fishing. These coolers have trays which separate ice from octopus and have capacity to store between 40 to 60 kg of octopuses. When reaching the landing site, octopuses are taken to the agents to be weighed and preserved in their storage facilities.

Fishers with own gear sell to anyone who has money at landing site or in the village but the fishers who use boats of large-scale fish traders take fish to the traders.

Traders

There are two categories of traders in Vanga, large scale traders commonly called dealers or Tajiri and small scale trader consisting of male fish traders (Wachuuzi) and female fish traders commonly called mama karangas.

Large scale traders

There are two main large scale traders dealing with octopus in Vanga. They are specialized in octopus but also deals with mixed reef fish i.e. grouper, parrot fish among others. The octopus dealers are also employed by Octopus Company to collects octopuses and inform the company driver to come and collect octopus for processing in Mombasa. One dealer, Amri Hassan is employed by Sea Harvest owned by Mr. Paul from Italy while the other dealer, Abu Mohamed is contracted by Trans-Africa Company owned by Mr. Amir

Dealers/Agents mainly sell to the two exporters company but at times the sell to direct consumers but not too much i.e not exceeding 1.5kg because their aim is to collect or buy as many kilograms as possible to sell to the large scale exporters' company, Sea Harvest and Trans-Africa. They do not sell octopuses to small scale traders.

These Companies buy from agents from the following landing sites: Vanga, Shimoni, Msambweni, Nyali, Ukunda e.t.c and transport them to their site where processing takes place. They export to Italy and other Western Countries. They are also suppliers of big hotels like Normad hotel in Malindi.

The dealers buy and sell octopus at the Vanga landing sites where they have their fish shops which acts as an octopus collecting centre.

Dealers are not involved in transportation of octopuses as fishermen bring octopus at the shop and the large scale traders/exporters come to buy from the shop since they have their own means of transportation i.e. special trucks with coolers for storage till they reach the company.

From the sea, the agents do not process octopus in any way. What they are involved in is only preservation as they wait for companies trucks to collect. Their storage facilities have capacity to store not less than 200kg and not more than 900kg. The exporters process after reaching their premises. The octopuses are squeezed with a machine to make them soft after ink is removed and then washed before been packed in polythene bags. 500kg of octopus is usually reduced to between 475 - 480 kg after the processing as the processing removes dirt thus reducing octopus mass

Male fish traders

There are around 70 male fish traders buying fish at Vanga landing site. They also buy octopuses.

They use own or hired motorbikes and bicycles to transport octopus. They buy big octopuses 1kg and above at vanga landing site.

Small-scale male fish traders hawk or sell octopuses in their fish stands in villages they live i.e. Mwangulu and Lunga lunga in Kwale County.

Female fish traders

Female fish traders buying at Vanga landing sites are around 45. Apart from buying mixed reef fish they also buy mainly small or young octopuses less than 1kg at vanga fish landing site from fishermen.

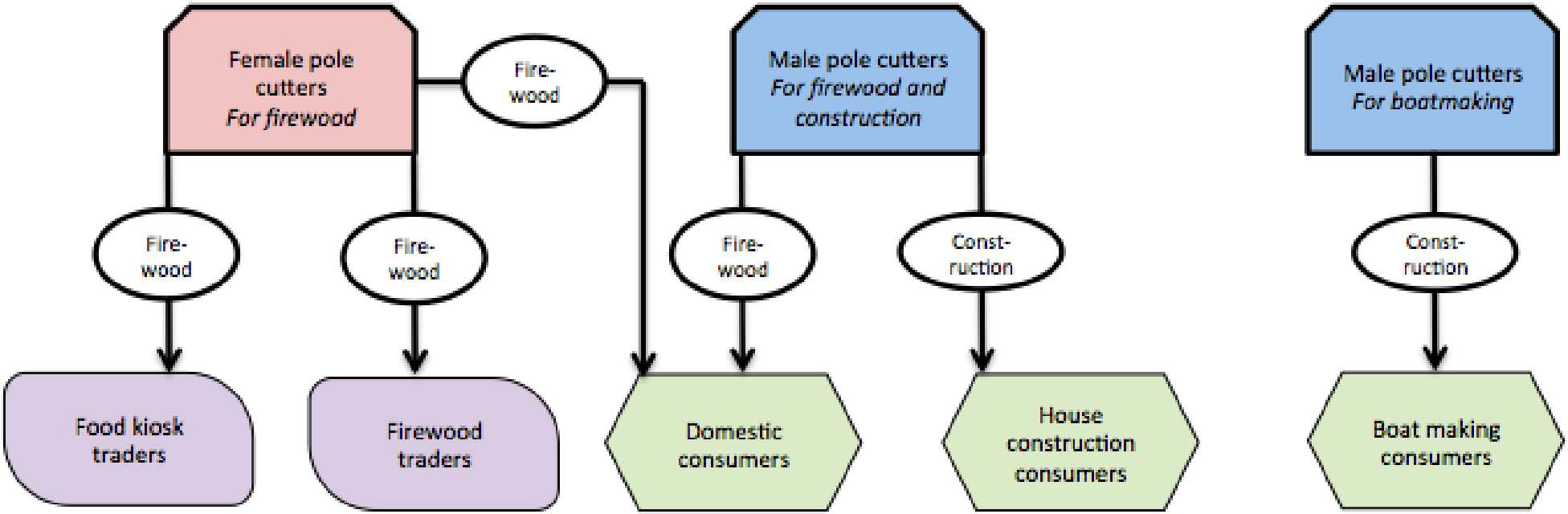
They normally use public transport vehicles to transport fish.

They process by hitting with stick to soften the octopus, wash, boiling, cutting in to small pieces and the frying them before selling to customer in their residential areas i.e. vanga, Jego and lunga lunga.

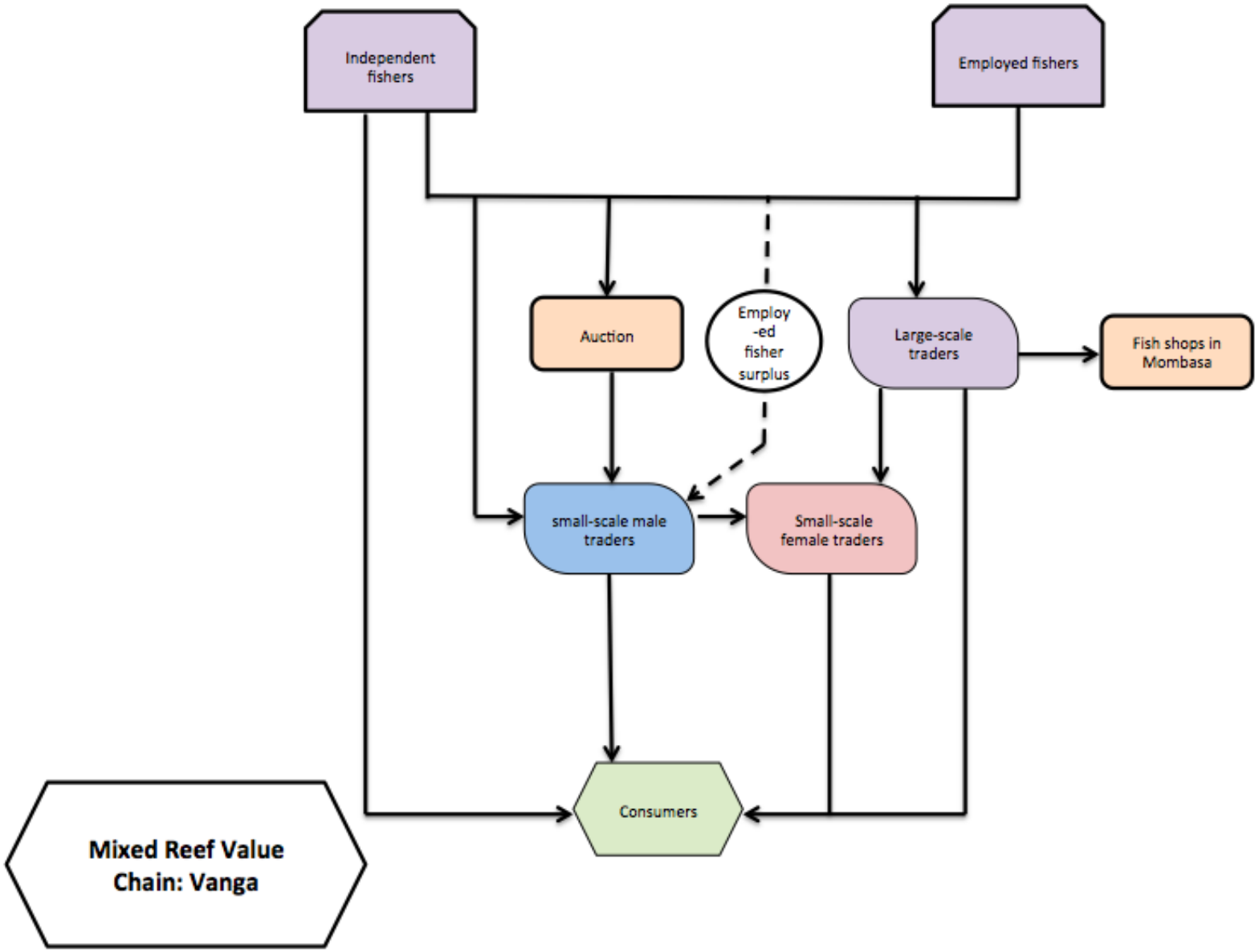
Complexity proxies

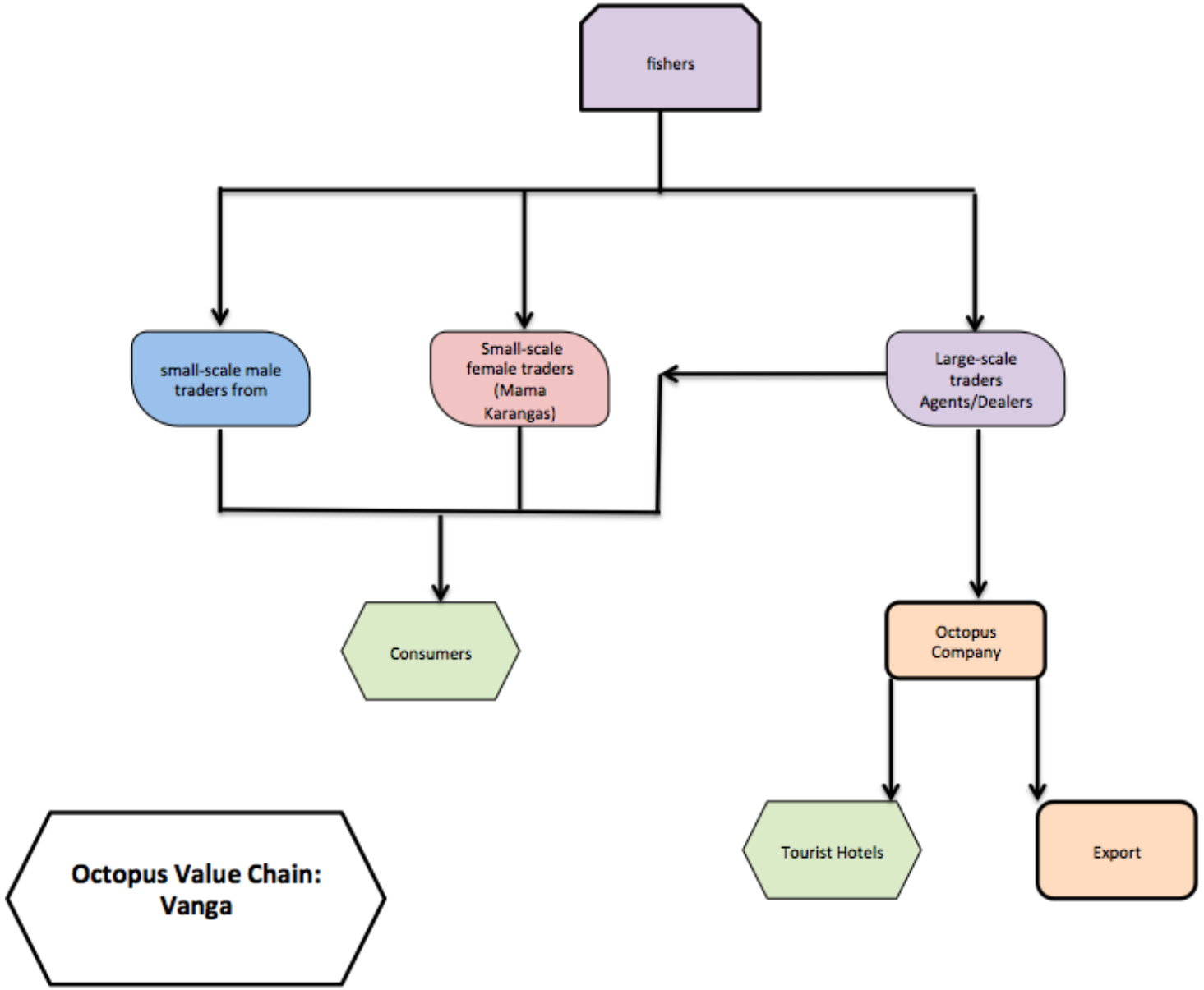
Median number of nodes: 2

Median number of pathways: 2



Mangrove Pole Value Chain: Vanga


Independent fishers
Employed fishers
Auction
Employ -ed fisher surplus
Large-scale traders
Fish shops in Mombasa
small-scale male traders
Small-scale female traders
Consumers
Mixed Reef Value Chain: Vanga


fishers
small-scale male traders from
Small-scale female traders (Mama Karangas)
Large-scale traders Agents/Dealers
Consumers
Octopus Company
Tourist Hotels
Export
Octopus Value Chain: Vanga

Comparison of Complexity proxies across sites

	Pelagic fish: Jimbo	Mixed reef: Kongowea	Octopus: Kongowea	Mangrove pole: Tsunza	Mangrove pole: Vanga	Mixed reef: Vanga	Octopus: Vanga
Median number of nodes	3	3	3	2	1	3	2
Median number of pathways	2,5	6	2	2	1	7	2

Appendix 1: Value Chain Analysis

Mapping Sampling

The value chain mapping exercise was conducted in the following sites Jimbo, Vanga, Tsunza, Kongowea from 2014-11-28 to 2015-01-31.
The aim was to get a better understanding of how a set of commodities flow from the point of extraction all the way to the end consumer, who benefits in this trade and opportunities for improvement in the chain the SPACES project conducts interviews with fishers, fish traders, processing companies, mangrove cutters and traders as well as observations at landings sites and markets.

Sampling strategy was going to landing sites and randomly select informants with relevant information and talk to. Thereafter, Individual interview transcripts were analysed to build up a picture of the value chains (thus making the site report with a description of value chains, list of interview and observations and) a map of octopus, mixed reef fish and mangroves poles showing the value chain structure.
Both male and female actors were interviewed. This includes pole cutters and pole/firewood traders, fishers and traders of different gears and kinds and well informed people within the village. Below is a summary of the achievement.

Site	Commodity	No. of interviews	Total
Vanga	Octopus	7	25
	Mixed reef fish	11	
	Mangrove pole	7	

Tsunza	Mangrove pole	13	13
Jimbo	Small pelagics	15	15
Kongowea	Octopus	8	23
	Mixed reef fish	15	

VCA survey sampling

Training with Tim & Matilda: 29th jan 2015 and 30th jan 2015
Piloting and translation was done from 31st jan 2015 to 7th feb 2015. The sampling areas for the pilot were Jomo Kenyatta public beach, Kirkland and Ngoloko villages in Kikambala. The enumerators visited the area and randomly selected fishers and fish traders. The feedback from the pilot was then discussed and necessary changes were made. A total of 12 interviews were done comprising of 6 fishers and 6 fish traders (2male traders & 4 female traders) all interviews were conducted using a questionnaire structured in Swahili version

The table below summarizes the training and piloting;

DATE	ACTIVITY	SITE
29/01/2015	Training	Spaces office
30/01/2015	Training	Spaces office
31/01/2015	Piloting	Jomo Kenyatta public beach
01/02/2015	Translation from English to Swahili	Spaces office
02/02/2015	Piloting	Kirkland
03/02/2015	Translation from English to Swahili	Spaces office
04/02/2015	Piloting	Ngoloko
05/02/2015	Off-day	
06/02/2015	Translation from English to Swahili	Spaces office
07/02/2015	Meeting Tim & Matilda in the morning and final development of the research tool in the afternoon	Moi international airport & spaces office

Field work overview

The field Team travels to the site and do the following before the actual survey:

- **Populating and triangulation of actors list**

With the help of the field guide, the team walks around the site to populate and triangulate the list of actors. In addition to, the community was invited to attend the meeting the next day.

- **Community meeting**

The participants of the meeting included the local/community/religious leaders. The aim of this meeting was to share findings from household survey and introduce the VCA survey.
Here the community was more than happy for SPACES to take that initiative of informing the community prior to undertaking the intended activity.
It was explained that, as part of the SPACES project, value chains survey aims at understanding how different people benefit from working with mangrove poles. Respondent's answers will be combined with other people's answers to understand how people are benefitting from coastal resources. This understanding will be written in scientific reports and presented but we will not say who gave the information.

1. VCA SURVEY IN KONGOWEA

VCA survey for mixed reef fish and octopus in Kongowea was done from 10/02/2015 to 06/03/2015. The sampling areas were Reef, mkomani (English point) and Nyali landing sites. Population of fishers and traders was obtained from figures obtained during the V.C.A mapping exercise done at this site. The full list of actors could not be obtained from the BMU officials since their term of office had ended and an interim body existed pending elections and fresh registration of members which was to be done during the V.C.A survey period.

The sample size for fishers and traders was obtained by calculating the proportion of total actors separately for fishers and traders using the below formula.

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size (e.g. total number of fishers engaged in Octopus fish) and e is the level of precision, in this case 0.05. This calculation is based on Yamane (1967)

After calculating the sample size, fishers and traders were interviewed with an aim of achieving the sample size. The target sample size was not achieved since some actors were migrants while others had stopped fishing activities and were not available during the survey period. The table below shows the summary of the sample size achieved.

KONGOWEA	**Fishers**	**Traders**
Population size	136	100
Sample size	101	80
Achievement	92	66

The fishers were generally sampled regardless of the gear used for fishing. The traders were also generally sampled regardless of the type of fish they trade.

List of interviews conducted

Enumerator name	**Date**	**Questionnaire ID**	**Fishers**	**fish Traders**
Christopher	10/02/2015	ff/1/kon/10022015/cc	1	
Rosebelle	10/02/2015	ft/1/kon/10022015/ra		1
Innocent	10/02/2015	ft/1/kon/10022015/im		1
Stephen	10/02/2015	ff/1/kon/10022015/sw	1	
Rosebelle	11/02/2015	ft/1/kon/11022015/ra		1
Stephen	11/02/2015	ff/1/kon/11022015/sw	1	
Stephen	11/02/2015	ff/2/kon/11022015/sw	1	
Rosebelle	11/02/2015	ff/1/kon/11022015/ra	1	
Christopher	11/02/2015	ft/1/kon/11022015/cc		1
Christopher	11/02/2015	ft/2/kon/11022015/cc		1
Innocent	11/02/2015	ft/1/kon/11022015/im		1
Innocent	11/02/2015	ff/1/kon/11022015/im	1	
Innocent	11/02/2015	ft/2/kon/11022015/im		1
Rosebelle	12/02/2015	ff/1/kon/12022015/ra	1	
Stephen	12/02/2015	ff/2/kon/12022015/sw	1	

Stephen	12/02/2015	ff/1/kon/12022015/sw	1	
Rosebelle	12/02/2015	ft/1/kon/12022015/ra		1
Christopher	12/02/2015	ff/1/kon/12022015/cc	1	
Christopher	12/02/2015	ft/1/kon/12022015/cc		1
Innocent	12/02/2015	ff/1/kon/12022015/im	1	
Innocent	12/02/2015	ff/2/kon/12022015/im	1	
Rosebelle	13/02/2015	ff/1/kon/13022015/ra	1	
Rosebelle	13/02/2015	ff/2/kon/13022015/ra	1	
Stephen	13/02/2015	ff/1/kon/13022015/sw	1	
Christopher	13/02/2015	ff/1/kon/13022015/cc	1	
Innocent	13/02/2015	ff/1/kon/13022015/im	1	
Innocent	13/02/2015	ff/2/kon/13022015/im	1	
Christopher	13/02/2015	ff/2/kon/13022015/cc	1	
Stephen	14/02/2015	ff/1/kon/14022015/sw	1	
Stephen	14/02/2015	ff/2/kon/14022015/sw	1	
Rosebelle	14/02/2015	ff/1/kon/14022015/ra	1	
Christopher	14/02/2015	ff/1/kon/14022015/cc	1	
Innocent	14/02/2015	ff/1/kon/14022015/im	1	
Rosebelle	16/02/2015	ff/1/kon/16022015/ra	1	
Rosebelle	16/02/2015	ff/2/kon/16022015/ra	1	
Innocent	16/02/2015	ff/1/kon/16022015/im	1	
Innocent	16/02/2015	ff/2/kon/16022015/im	1	
Christopher	16/02/2015	ff/1/kon/16022015/cc	1	
Christopher	16/02/2015	ff/2/kon/16022015/cc	1	
Stephen	16/02/2015	ff/1/kon/16022015/sw	1	
Stephen	16/02/2015	ff/2/kon/16022015/sw	1	
Innocent	17/02/2015	ff/1/kon/17022015/im	1	
Innocent	17/02/2015	ff/2/kon/17022015/im	1	
Rosebelle	17/02/2015	ff/1/kon/17022015/ra	1	
Rosebelle	17/02/2015	ft/1/kon/17022015/ra		1
Christopher	17/02/2015	ff/1/kon/17022015/cc	1	
Stephen	17/02/2015	ff/1/kon/17022015/sw	1	
Stephen	17/02/2015	ft/1/kon/17022015/sw		1
Christopher	18/02/2015	ff/1/kon/18022015/cc	1	
Christopher	18/02/2015	ft/1/kon/18022015/cc		1
Innocent	18/02/2015	ff/1/kon/18022015/im	1	
Rosebelle	18/02/2015	ft/1/kon/18022015/ra		1
Rosebelle	18/02/2015	ft/2/kon/18022015/ra		1
Innocent	18/02/2015	ff/2/kon/18022015/im	1	
Stephen	18/02/2015	ft/1/kon/18022015/sw		1
Stephen	18/02/2015	ff/1/kon/18022015/sw	1	
Innocent	19/02/2015	ft/1/kon/19022015/im		1
Innocent	19/02/2015	ft/2/kon/19022015/im		1
Christopher	19/02/2015	ft/1/kon/19022015/cc		1
Rosebelle	19/02/2015	ft/1/kon/19022015/ra		1
Rosebelle	19/02/2015	ft/2/kon/19022015/ra		1
Stephen	19/02/2015	ff/1/kon/19022015/sw	1	

Stephen	19/02/2015	ft/1/kon/19022015/sw		1
Christopher	20/02/2015	ff/1/kon/20022015/cc	1	
Innocent	20/02/2015	ff/1/kon/20022015/im	1	
Innocent	20/02/2015	ft/1/kon/20022015/im		1
Rosebelle	20/02/2015	ff/1/kon/20022015/ra	1	
Rosebelle	20/02/2015	ft/1/kon/20022015/ra		1
Stephen	20/02/2015	ff/1/kon/20022015/sw	1	
Innocent	21/02/2015	ft/1/kon/21022015/im		1
Innocent	21/02/2015	ff/1/kon/21022015/im	1	
Rosebelle	21/02/2015	ff/1/kon/21022015/ra	1	
Rosebelle	21/02/2015	ff/2/kon/21022015/ra	1	
Stephen	21/02/2015	ft/1/kon/21022015/sw		1
Christopher	23/02/2015	ft/1/kon/23022015/cc		1
Christopher	23/02/2015	ft/2/kon/23022015/cc		1
Rosebelle	23/02/2015	ft/1/kon/23022015/ra		1
Rosebelle	23/02/2015	ft/2/kon/23022015/ra		1
Stephen	23/02/2015	ft/1/kon/23022015/sw		1
Stephen	23/02/2015	ft/2/kon/23022015/sw		1
Innocent	23/02/2015	ft/1/kon/23022015/im		1
Stephen	24/02/2015	ft/1/kon/24022015/sw		1
Christopher	24/02/2015	ff/1/kon/24022015/cc	1	
Innocent	24/02/2015	ft/1/kon/24022015/im		1
Innocent	24/02/2015	ft/2/kon/24022015/im		1
Rosebelle	24/02/2015	ff/1/kon/24022015/ra	1	
Rosebelle	24/02/2015	ff/2/kon/24022015/ra	1	
Innocent	25/02/2015	ff/1/kon/25022015/im	1	
Innocent	25/02/2015	ff/2/kon/25022015/im	1	
Rosebelle	25/02/2015	ff/1/kon/25022015/ra	1	
Rosebelle	25/02/2015	ff/2/kon/25022015/ra	1	
Stephen	25/02/2015	ff/1/kon/25022015/sw	1	
Stephen	25/02/2015	ff/2/kon/25022015/sw	1	
Stephen	25/02/2015	ff/3/kon/25022015/sw	1	
Christopher	26/02/2015	ft/1/kon/26022015/cc		1
Stephen	26/02/2015	ff/1/kon/26022015/sw	1	
Stephen	26/02/2015	ff/2/kon/26022015/sw	1	
Innocent	26/02/2015	ff/1/kon/26022015/im	1	
Rosebelle	26/02/2015	ff/1/kon/26022015/ra	1	
Rosebelle	26/02/2015	ff/2/kon/26022015/ra	1	
Stephen	27/02/2015	ft/1/kon/27022015/sw		1
Stephen	27/02/2015	ft/1/kon/27022015/sw		1
Christopher	27/02/2015	ft/1/kon/27022015/cc		1
Christopher	27/02/2015	ff/1/kon/27022015/cc	1	
Innocent	27/02/2015	ff/1/kon/27022015/im	1	
Innocent	27/02/2015	ff/2/kon/27022015/im	1	
Innocent	27/02/2015	ft/1/kon/27022015/im		1
Innocent	27/02/2015	ft/2/kon/27022015/im		1
Christopher	28/02/2015	ft/1/kon/28022015/cc		1

Christopher	28/02/2015	ft/2/kon/28022015/cc		1
Stephen	28/02/2015	ft/1/kon/28022015/sw		1
Stephen	28/02/2015	ft/2/kon/28022015/sw		1
Innocent	28/02/2015	ft/1/kon/28022015/im		1
Innocent	28/02/2015	ff/1/kon/28022015/im	1	
Rosebelle	28/02/2015	ft/1/kon/28022015/ra		1
Rosebelle	28/02/2015	ft/2/kon/28022015/ra		1
Rosebelle	02/03/2015	ff/1/kon/02032015/ra	1	
Rosebelle	02/03/2015	ft/1/kon/02032015/ra		1
Innocent	02/03/2015	ft/1/kon/02032015/im		1
Innocent	02/03/2015	ft/2/kon/02032015/im		1
Stephen	02/03/2015	ft/1/kon/02032015/sw		1
Stephen	02/03/2015	ft/2/kon/02032015/sw		1
Christopher	02/03/2015	ft/1/kon/02032015/cc		1
Christopher	02/03/2015	ff/1/kon/02032015/cc	1	
Rosebelle	03/03/2015	ft/1/kon/03032015/ra		1
Rosebelle	03/03/2015	ff/1/kon/03032015/ra	1	
Innocent	03/03/2015	ft/1/kon/03032015/im		1
Innocent	03/03/2015	ft/2/kon/03032015/im		1
Innocent	03/03/2015	ff/1/kon/03032015/im	1	
Stephen	03/03/2015	ft/1/kon/03032015/sw		1
Stephen	03/03/2015	ft/2/kon/03032015/sw		1
Christopher	03/03/2015	ft/1/kon/03032015/cc		1
Christopher	03/03/2015	ff/2/kon/03032015/cc	1	
Christopher	03/03/2015	ff/1/kon/03032015/cc	1	
Christopher	04/03/2015	ff/2/kon/04032015/cc	1	
Christopher	04/03/2015	ff/1/kon/04032015/cc	1	
Innocent	04/03/2015	ff/1/kon/04032015/im	1	
Innocent	04/03/2015	ff/2/kon/04032015/im	1	
Stephen	04/03/2015	ft/1/kon/04032015/sw		1
Stephen	04/03/2015	ff/1/kon/04032015/sw	1	
Stephen	04/03/2015	ff/2/kon/04032015/sw	1	
Rosebelle	04/03/2015	ft/1/kon/04032015/ra		1
Rosebelle	04/03/2015	ft/2/kon/04032015/ra		1
Christopher	05/03/2015	ff/1/kon/05032015/cc	1	
Christopher	05/03/2015	ff/2/kon/05032015/cc	1	
Rosebelle	05/03/2015	ff/1/kon/05032015/ra	1	
Rosebelle	05/03/2015	ft/1/kon/05032015/ra		1
Innocent	05/03/2015	ff/1/kon/05032015/im	1	
Innocent	05/03/2015	ff/2/kon/05032015/im	1	
Stephen	05/03/2015	ff/1/kon/05032015/sw	1	
Stephen	05/03/2015	ff/2/kon/05032015/sw	1	
Stephen	05/03/2015	ft/1/kon/05032015/sw		1
Christopher	06/03/2015	ft/1/kon/06032015/cc		1
Christopher	06/03/2015	ff/1/kon/06032015/cc	1	
Rosebelle	06/03/2015	ff/1/kon/06032015/ra	1	
Innocent	06/03/2015	ff/1/kon/06032015/im	1	

Innocent	06/03/2015	ff/2/kon/06032015/im	1
Innocent	06/03/2015	ff/3/kon/06032015/im	1

2. VCA SURVEY IN TSUNZA.

VCA survey for mangrove poles in Tsunza was done from 10/03/2015 to 22/03/2015. The full list of actors (Population size) was obtained by extracting names of people doing pole cutting and collecting firewood from the household survey since the value chain mapping for mangroves could not give an estimate population for mangrove pole cutters and traders. The list was triangulated after obtaining additional names of actors from other pole cutters and a total population of 130 actors involved in pole cutting and firewood collection was obtained. It was difficult to get the population size of traders as all of them are in Miritini and Portreitz areas of Mombasa and they are scattered.

The sample size for actors involved in pole cutting and firewood collection was achieved by calculating a proportion of the total actors using the formula below separately for pole cutters and traders:

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size (e.g. total number of fishers engaged in Octopus fish) and e is the level of precision, in this case 0.05. This calculation is based on Yamane (1967). The table below summarizes the results obtained.

TSUNZA	**Pole cutters**	**Traders**
Population size	130	?
Sample size	98	?
Achievement	35	23

After calculating the sample size, the respondents were randomly selected from the list.
The formula was not used to get the sample size for traders as they are very few i.e. less than 25 and every trader who gave consent was interviewed.

List of interviews conducted

Enumerator name	**Date**	**Questionnaire ID**	**pole cutters**	**pole traders**
Christopher	10/03/2015	pc/1/tsu/10032015/cc	1	
Christopher	10/03/2015	pc/2/tsu/10032015/cc	1	
Christopher	10/03/2015	pc/3/tsu/10032015/cc	1	
Innocent	10/03/2015	pc/1/tsu/10032015/im	1	
Innocent	10/03/2015	pc/2/tsu/10032015/im	1	
Stephen	10/03/2015	pc/1/tsu/10032015/sw	1	
Stephen	11/03/2015	pc/1/tsu/11032015/sw	1	
Stephen	11/03/2015	pc/2/tsu/11032015/sw	1	
Christopher	11/03/2015	pc/1/tsu/11032015/cc	1	
Christopher	11/03/2015	pc/2/tsu/11032015/cc	1	
Innocent	11/03/2015	pc/1/tsu/11032015/im	1	

Stephen	12/03/2015	pc/1/tsu/12032015/sw	1	
Christopher	12/03/2015	pc/1/tsu/12032015/cc	1	
Christopher	12/03/2015	pc/2/tsu/12032015/cc	1	
Innocent	12/03/2015	pc/1/tsu/12032015/im	1	
Innocent	12/03/2015	pc/2/tsu/12032015/im	1	
Stephen	13/03/2015	pc/1/tsu/13032015/sw	1	
Christopher	13/03/2015	pc/1/tsu/13032015/cc	1	
Innocent	13/03/2015	pc/1/tsu/13032015/im	1	
Innocent	13/03/2015	pc/2/tsu/13032015/im	1	
Christopher	14/03/2015	pc/1/tsu/14032015/cc	1	
Stephen	14/03/2015	pt/1/tsu/14032015/sw		1
Stephen	14/03/2015	pt/2/tsu/14032015/sw		1
Innocent	16/03/2015	pt/1/tsu/16032015/im		1
Innocent	16/03/2015	pt/2/tsu/16032015/im		1
Stephen	16/03/2015	pt/1/tsu/16032015/sw		1
Stephen	16/03/2015	pt/2/tsu/16032015/sw		1
Christopher	16/03/2015	pc/1/tsu/16032015/cc	1	
Rosebelle	16/03/2015	pt/1/tsu/16032015/ra		1
Rosebelle	16/03/2015	pc/1/tsu/16032015/ra	1	
Stephen	17/03/2015	pt/1/tsu/17032015/sw		1
Stephen	17/03/2015	pt/2/tsu/17032015/sw		1
Rosebelle	17/03/2015	pt/1/tsu/17032015/ra		1
Innocent	17/03/2015	pt/1/tsu/17032015/im		1
Innocent	17/03/2015	pt/2/tsu/17032015/im		1
Stephen	18/03/2015	pt/1/tsu/18032015/sw		1
Stephen	18/03/2015	pt/2/tsu/18032015/sw		1
Christopher	18/03/2015	pc/1/tsu/18032015/cc	1	
Rosebelle	18/03/2015	pc/1/tsu/18032015/ra	1	
Innocent	18/03/2015	pt/1/tsu/18032015/im		1
Stephen	19/03/2015	pt/1/tsu/19032015/sw		1
Christopher	19/03/2015	pc/1/tsu/19032015/cc	1	
Rosebelle	19/03/2015	pt/1/tsu/19032015/ra		1
Rosebelle	19/03/2015	pc/1/tsu/19032015/ra	1	
Innocent	19/03/2015	pt/1/tsu/19032015/im		1
Stephen	20/03/2015	pt/1/tsu/20032015/sw		1
Christopher	20/03/2015	pc/1/tsu/20032015/cc	1	
Christopher	20/03/2015	pc/2/tsu/20032015/cc	1	
Rosebelle	20/03/2015	pt/1/tsu/20032015/ra		1
Rosebelle	20/03/2015	pc/1/tsu/20032015/ra	1	
Christopher	21/03/2015	pc/1/tsu/21032015/cc	1	
Christopher	21/03/2015	pc/2/tsu/21032015/cc	1	
Rosebelle	21/03/2015	pc/1/tsu/21032015/ra	1	
Innocent	21/03/2015	pc/1/tsu/21032015/im	1	
Stephen	22/03/2015	pt/1/tsu/22032015/sw		1
Christopher	22/03/2015	pc/1/tsu/22032015/cc	1	
Rosebelle	22/03/2015	pt/1/tsu/22032015/ra		1
Innocent	22/03/2015	pt/1/tsu/22032015/im		1

3. VCA SURVEY IN VANGA

VCA survey for mangrove poles, mixed reef fish and octopus in Vanga was done from 28/03/2015 to 23/04/2015. For fishing, the Vanga B.M.U provided a list of fishers and traders for both B.M.U members and non-members. The population size was obtained by populating and triangulating the full list of actors.

For poles, the list of pole traders in the site could not be obtained since the pole cutters also act as traders.

The sample size for fishers and small-scale fish traders as well as pole cutters were arrived at separately using the formula below.

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size (e.g. total number of fishers engaged in Octopus fish) and e is the level of precision, in this case 0.05. This calculation is based on Yamane (1967).
After calculating the sample size, the respondents were randomly selected from the list.

The table below shows a summary of the sampling for Vanga.

VANGA	**Fishers**	**Traders**
Population size	204	69
Sample size	135	59
Achievement	135	59
	Pole cutters	**Traders**
Population size	21	0
Sample size	20	0
Achievement	**18**	**0**

The fishers were generally sampled regardless of gear used or fish type. The formula above was used to sample small-scale traders and not large –sale traders as they are very few i.e. less than 10 but rather all of them were interviewed.

List of interviews conducted

Enumerator name	**Date**	**Questionnaire ID**	**Fishers**	**fish Traders**	**pole cutters**	**pole traders**
Innocent	28/03/2015	ff/1/van/28032015/im	1			
Innocent	28/03/2015	ff/2/van/28032015/im	1			
Rosebelle	28/03/2015	ft/1/van/28032015/ra		1		
Rosebelle	28/03/2015	pc/1/van/28032015/ra			1	
Stephen	28/03/2015	ff/1/van/28032015/sw	1			
Stephen	28/03/2015	ff/2/van/28032015/sw	1			
Christopher	28/03/2015	ff/1/van/28032015/cc	1			
Christopher	28/03/2015	ff/2/van/28032015/cc	1			

Christopher	28/03/2015	ft/1/van/28032015/cc		1		
Innocent	30/03/2015	ft/1/van/30032015/im		1		
Innocent	30/03/2015	ft/2/van/30032015/im		1		
Innocent	30/03/2015	ff/1/van/30032015/im	1			
Rosebelle	30/03/2015	ft/1/van/30032015/ra		1		
Rosebelle	30/03/2015	ff/1/van/30032015/ra	1			
Christopher	30/03/2015	ft/1/van/30032015/cc		1		
Christopher	30/03/2015	ft/2/van/30032015/cc		1		
Christopher	30/03/2015	ft/3/van/30032015/cc		1		
Stephen	30/03/2015	ft/1/van/30032015/sw		1		
Stephen	30/03/2015	ft/2/van/30032015/sw		1		
Innocent	31/03/2015	ff/1/van/31032015/im	1			
Rosebelle	31/03/2015	ft/1/van/31032015/ra		1		
Rosebelle	31/03/2015	ff/1/van/31032015/ra	1			
Christopher	31/03/2015	ff/1/van/31032015/cc	1			
Christopher	31/03/2015	ff/2/van/31032015/cc	1			
Christopher	31/03/2015	ff/3/van/31032015/cc	1			
Stephen	31/03/2015	ff/1/van/31032015/sw	1			
Stephen	31/03/2015	ff/2/van/31032015/sw	1			
Stephen	31/03/2015	ft/1/van/31032015/sw		1		
Innocent	01/04/2015	ff/1/van/01042015/im	1			
Rosebelle	01/04/2015	ft/1/van/01042015/ra		1		
Rosebelle	01/04/2015	ff/1/van/01042015/ra	1			
Christopher	01/04/2015	ff/1/van/01042015/cc	1			
Christopher	01/04/2015	ff/2/van/01042015/cc	1			
Christopher	01/04/2015	ft/1/van/01042015/cc		1		
Stephen	01/04/2015	ff/1/van/01042015/sw	1			
Stephen	01/04/2015	ff/2/van/01042015/sw	1			
Innocent	02/04/2015	ff/1/van/02042015/im	1			
Innocent	02/04/2015	ft/1/van/02042015/im		1		
Rosebelle	02/04/2015	pc/1/van/02042015/ra				1
Rosebelle	02/04/2015	ff/1/van/02042015/ra	1			
Christopher	02/04/2015	ff/1/van/02042015/cc	1			
Christopher	02/04/2015	ft/1/van/02042015/cc		1		
Stephen	02/04/2015	ft/1/van/02042015/sw		1		
Stephen	02/04/2015	ff/1/van/02042015/sw	1			
Innocent	03/04/2015	ft/1/van/03042015/im		1		
Innocent	03/04/2015	ff/1/van/03042015/im	1			
Rosebelle	03/04/2015	ff/1/van/03042015/ra	1			
Rosebelle	03/04/2015	ff/2/van/03042015/ra	1			
Christopher	03/04/2015	ff/1/van/03042015/cc	1			
Christopher	03/04/2015	ff/2/van/03042015/cc	1			
Christopher	03/04/2015	ff/3/van/03042015/cc	1			
Stephen	03/04/2015	ft/1/van/03042015/sw		1		
Stephen	03/04/2015	ff/1/van/03042015/sw	1			
Innocent	04/04/2015	ff/1/van/04042015/im	1			
Innocent	04/04/2015	ff/2/van/04042015/im	1			

Rosebelle	04/04/2015	ff/1/van/04042015/ra	1		
Rosebelle	04/04/2015	ft/1/van/04042015/ra		1	
Stephen	04/04/2015	pc/1/van/04042015/sw			1
Christopher	04/04/2015	ff/1/van/04042015/cc	1		
Christopher	04/04/2015	ff/2/van/04042015/cc	1		
Christopher	04/04/2015	ff/3/van/04042015/cc	1		
Innocent	06/04/2015	ft/1/van/06042015/im		1	
Innocent	06/04/2015	ft/2/van/06042015/im		1	
Rosebelle	06/04/2015	ft/1/van/06042015/ra		1	
Rosebelle	06/04/2015	ff/1/van/06042015/ra	1		
Christopher	06/04/2015	ft/1/van/06042015/cc		1	
Christopher	06/04/2015	ff/1/van/06042015/cc	1		
Stephen	06/04/2015	ft/1/van/06042015/sw		1	
Stephen	06/04/2015	ft/2/van/06042015/sw		1	
Stephen	06/04/2015	ff/1/van/06042015/sw	1		
Innocent	07/04/2015	pc/1/van/07042015/im			1
Innocent	07/04/2015	ff/1/van/07042015/im	1		
Rosebelle	07/04/2015	ft/1/van/07042015/ra		1	
Rosebelle	07/04/2015	ff/1/van/07042015/ra	1		
Christopher	07/04/2015	ff/1/van/07042015/cc	1		
Christopher	07/04/2015	pc/1/van/07042015/cc			1
Stephen	07/04/2015	pc/1/van/07042015/sw			1
Stephen	07/04/2015	ff/1/van/07042015/sw	1		
Stephen	07/04/2015	ff/2/van/07042015/sw	1		
Innocent	08/04/2015	ff/1/van/08042015/im	1		
Innocent	08/04/2015	ff/2/van/08042015/im	1		
Innocent	08/04/2015	ff/3/van/08042015/im	1		
Christopher	08/04/2015	ff/1/van/08042015/cc	1		
Christopher	08/04/2015	ff/2/van/08042015/cc	1		
Christopher	08/04/2015	ff/3/van/08042015/cc	1		
Rosebelle	08/04/2015	ff/1/van/08042015/ra	1		
Rosebelle	08/04/2015	ff/2/van/08042015/ra	1		
Stephen	08/04/2015	ff/1/van/08042015/sw	1		
Stephen	08/04/2015	ff/2/van/08042015/sw	1		
Stephen	08/04/2015	ff/3/van/08042015/sw	1		
Innocent	09/04/2015	ff/1/van/09042015/im	1		
Innocent	09/04/2015	ff/2/van/09042015/im	1		
Rosebelle	09/04/2015	ff/1/van/09042015/ra	1		
Rosebelle	09/04/2015	pc/1/van/09042015/ra			1
Christopher	09/04/2015	ff/1/van/09042015/cc	1		
Christopher	09/04/2015	ff/2/van/09042015/cc	1		
Stephen	09/04/2015	pc/1/van/09042015/sw			1
Stephen	09/04/2015	pc/2/van/09042015/sw			1
Innocent	10/04/2015	ff/1/van/10042015/im	1		
Rosebelle	10/04/2015	pc/1/van/10042015/ra			1
Rosebelle	10/04/2015	ff/1/van/10042015/ra	1		
Christopher	10/04/2015	ff/1/van/10042015/cc	1		

Christopher	10/04/2015	ff/2/van/10042015/cc	1			
Christopher	10/04/2015	ff/3/van/10042015/cc	1			
Stephen	10/04/2015	ff/1/van/10042015/sw	1			
Stephen	10/04/2015	ff/2/van/10042015/sw	1			
Innocent	11/04/2015	ff/1/van/11042015/im	1			
Innocent	11/04/2015	ff/2/van/11042015/im	1			
Christopher	11/04/2015	ff/1/van/11042015/cc	1			
Christopher	11/04/2015	ff/2/van/11042015/cc	1			
Stephen	11/04/2015	ft/1/van/11042015/sw		1		
Stephen	11/04/2015	ft/2/van/11042015/sw		1		
Rosebelle	11/04/2015	ft/1/van/11042015/ra	1			
Rosebelle	11/04/2015	ft/2/van/11042015/ra	1			
Christopher	13/04/2015	ff/1/van/13042015/cc	1			
Christopher	13/04/2015	ff/2/van/13042015/cc	1			
Christopher	13/04/2015	ft/1/van/13042015/cc		1		
Innocent	13/04/2015	ff/1/van/13042015/im	1			
Innocent	13/04/2015	ff/2/van/13042015/im	1			
Innocent	13/04/2015	ft/1/van/13042015/im		1		
Stephen	13/04/2015	ff/1/van/13042015/sw	1			
Stephen	13/04/2015	pc/1/van/13042015/sw				1
Rosebelle	13/04/2015	pc/1/van/13042015/ra				1
Rosebelle	13/04/2015	ff/1/van/13042015/ra	1			
Christopher	14/04/2015	ff/1/van/14042015/cc	1			
Christopher	14/04/2015	ft/1/van/14042015/cc		1		
Innocent	14/04/2015	ff/1/van/14042015/im	1			
Innocent	14/04/2015	ff/2/van/14042015/im	1			
Rosebelle	14/04/2015	ft/1/van/14042015/ra		1		
Rosebelle	14/04/2015	ff/1/van/14042015/ra	1			
Stephen	14/04/2015	ff/1/van/14042015/sw	1			
Stephen	14/04/2015	ff/2/van/14042015/sw	1			
Stephen	14/04/2015	ft/1/van/14042015/sw		1		
Rosebelle	15/04/2015	ft/1/van/15042015/ra		1		
Innocent	15/04/2015	ff/1/van/15042015/im	1			
Christopher	15/04/2015	ft/1/van/15042015/cc		1		
Christopher	15/04/2015	ff/1/van/15042015/cc	1			
Stephen	15/04/2015	ff/1/van/15042015/sw	1			
Stephen	15/04/2015	ff/2/van/15042015/sw	1			
Stephen	15/04/2015	ft/1/van/15042015/sw		1		
Rosebelle	16/04/2015	pc/1/van/16042015/ra				1
Rosebelle	16/04/2015	ff/1/van/16042015/ra	1			
Innocent	16/04/2015	ft/1/van/16042015/im		1		
Innocent	16/04/2015	ff/1/van/16042015/im	1			
Christopher	16/04/2015	ft/1/van/16042015/cc		1		
Christopher	16/04/2015	ff/2/van/16042015/cc	1			
Christopher	16/04/2015	ff/1/van/16042015/cc	1			
Stephen	16/04/2015	ff/1/van/16042015/sw	1			
Stephen	16/04/2015	ff/2/van/16042015/sw	1			

Rosebelle	17/04/2015	ft/1/van/17042015/ra		1	
Rosebelle	17/04/2015	ff/1/van/17042015/ra	1		
Christopher	17/04/2015	ft/1/van/17042015/cc		1	
Christopher	17/04/2015	ff/1/van/17042015/cc	1		
Christopher	17/04/2015	ff/2/van/17042015/cc	1		
Stephen	17/04/2015	ff/1/van/17042015/sw	1		
Stephen	17/04/2015	ff/2/van/17042015/sw	1		
Stephen	17/04/2015	ff/3/van/17042015/sw	1		
Innocent	17/04/2015	ff/1/van/17042015/im	1		
Innocent	17/04/2015	ff/2/van/17042015/im	1		
Innocent	17/04/2015	ff/3/van/17042015/im	1		
Innocent	17/04/2015	ft/1/van/17042015/im		1	
Christopher	18/04/2015	ff/1/van/18042015/cc	1		
Christopher	18/04/2015	ff/2/van/18042015/cc	1		
Christopher	18/04/2015	ff/3/van/18042015/cc	1		
Innocent	18/04/2015	ff/1/van/18042015/im	1		
Innocent	18/04/2015	ff/2/van/18042015/im	1		
Innocent	18/04/2015	ff/3/van/18042015/im	1		
Rosebelle	18/04/2015	ff/1/van/18042015/ra	1		
Rosebelle	18/04/2015	ff/2/van/18042015/ra	1		
Christopher	20/04/2015	ft/1/van/20042015/cc		1	
Christopher	20/04/2015	ft/2/van/20042015/cc		1	
Christopher	20/04/2015	ft/3/van/20042015/cc		1	
Stephen	20/04/2015	ff/1/van/20042015/sw	1		
Stephen	20/04/2015	ff/2/van/20042015/sw	1		
Rosebelle	20/04/2015	ft/1/van/20042015/ra		1	
Rosebelle	20/04/2015	ff/1/van/20042015/ra	1		
Innocent	20/04/2015	ft/1/van/20042015/im		1	
Innocent	20/04/2015	ft/2/van/20042015/im		1	
Innocent	20/04/2015	ft/3/van/20042015/im		1	
Stephen	21/04/2015	pc/1/van/21042015/sw			1
Stephen	21/04/2015	pc/2/van/21042015/sw			1
Stephen	21/04/2015	ft/1/van/21042015/sw		1	
Christopher	21/04/2015	ff/1/van/21042015/cc	1		
Christopher	21/04/2015	ff/2/van/21042015/cc	1		
Christopher	21/04/2015	ft/1/van/21042015/cc		1	
Innocent	21/04/2015	ff/1/van/21042015/im	1		
Rosebelle	21/04/2015	pc/1/van/21042015/ra			1
Rosebelle	21/04/2015	ff/1/van/21042015/ra	1		
Stephen	22/04/2015	ff/1/van/22042015/sw	1		
Stephen	22/04/2015	ff/2/van/22042015/sw	1		
Stephen	22/04/2015	ff/3/van/22042015/sw	1		
Christopher	22/04/2015	ft/1/van/22042015/cc		1	
Christopher	22/04/2015	ft/2/van/22042015/cc		1	
Christopher	22/04/2015	ff/1/van/22042015/cc	1		
Rosebelle	22/04/2015	ft/1/van/22042015/ra		1	
Rosebelle	22/04/2015	ff/1/van/22042015/ra	1		

Innocent	22/04/2015	ft/2/van/22042015/im		1	
Innocent	22/04/2015	ff/2/van/22042015/im	1		
Innocent	22/04/2015	ft/1/van/22042015/im		1	
Innocent	22/04/2015	ff/1/van/22042015/im	1		
Stephen	23/04/2015	ff/1/van/23042015/sw	1		
Stephen	23/04/2015	ff/2/van/23042015/sw	1		
Christopher	23/04/2015	ff/1/van/23042015/cc	1		
Christopher	23/04/2015	ff/2/van/23042015/cc	1		
Christopher	23/04/2015	ft/1/van/23042015/cc		1	
Rosebelle	23/04/2015	ft/1/van/23042015/ra		1	
Rosebelle	23/04/2015	ft/2/van/23042015/ra		1	
Rosebelle	23/04/2015	ff/1/van/23042015/ra	1		
Innocent	23/04/2015	ff/1/van/23042015/im	1		
Innocent	23/04/2015	ff/2/van/23042015/im	1		
Innocent	23/04/2015	pc/1/van/23042015/im			1
Rosebelle	01/05/2015	pc/1/van/01052015/ra			1

4. VCA SURVEY IN JIMBO

VCA survey for dagaa in Jimbo was done from 25/04/2015 to 04/05/2015. Jimbo B.M.U provided a list of dagaa fishers and traders for both B.M.U members and non-members. The population size was obtained by populating and triangulating the full list of actors.

The sample size for dagaa fishers and traders (commonly known as wachemshaji) was arrived at separately using the formula below.

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size (e.g. total number of fishers engaged in Octopus fish) and e is the level of precision, in this case 0.05. This calculation is based on Yamane (1967).

After calculating the sample size, the respondents were randomly selected from the populated list.

JIMBO	**Dagaa fishers**	**Traders (wachemshaji)**
Population size	30	56
Sample size	28	49
Achievement	28	49

List of interviews conducted

Enumerator name	**Date**	**Questionnaire ID**	**Fishers**	**fish Traders**
Innocent	25/04/2015	ff/1/jim/25042015/im	1	
Innocent	25/04/2015	ft/1/jim/25042015/im		1
Stephen	25/04/2015	ff/1/jim/25042015/sw	1	
Stephen	25/04/2015	ft/1/jim/25042015/sw		1
Stephen	25/04/2015	ft/2/jim/25042015/sw		1
Christopher	25/04/2015	ff/1/jim/25042015/cc	1	
Christopher	25/04/2015	ft/1/jim/25042015/cc		1

Christopher	25/04/2015	ft/2/jim/25042015/cc		1
Rosebelle	25/04/2015	ft/1/jim/25042015/ra		1
Rosebelle	25/04/2015	ft/2/jim/25042015/ra		1
Innocent	27/04/2015	ff/1/jim/27042015/im	1	
Innocent	27/04/2015	ft/1/jim/27042015/im		1
Stephen	27/04/2015	ff/1/jim/27042015/sw	1	
Stephen	27/04/2015	ft/1/jim/27042015/sw		1
Stephen	27/04/2015	ft/2/jim/27042015/sw		1
Christopher	27/04/2015	ft/1/jim/27042015/cc		1
Christopher	27/04/2015	ft/2/jim/27042015/cc		1
Rosebelle	27/04/2015	ff/1/jim/27042015/ra	1	
Rosebelle	27/04/2015	ff/2/jim/27042015/ra	1	
Innocent	28/04/2015	ff/1/jim/28042015/im	1	
Innocent	28/04/2015	ft/1/jim/28042015/im		1
Stephen	28/04/2015	ff/1/jim/28042015/sw	1	
Christopher	28/04/2015	ft/1/jim/28042015/cc		1
Christopher	28/04/2015	ft/2/jim/28042015/cc		1
Christopher	28/04/2015	ft/3/jim/28042015/cc		1
Rosebelle	28/04/2015	ft/1/jim/28042015/ra		1
Rosebelle	28/04/2015	ft/2/jim/28042015/ra		1
Innocent	29/04/2015	ft/1/jim/29042015/im		1
Innocent	29/04/2015	ft/2/jim/29042015/im		1
Stephen	29/04/2015	ft/1/jim/29042015/sw		1
Stephen	29/04/2015	ft/2/jim/29042015/sw		1
Christopher	29/04/2015	ft/1/jim/29042015/cc		1
Christopher	29/04/2015	ft/2/jim/29042015/cc		1
Christopher	29/04/2015	ff/1/jim/29042015/cc	1	
Rosebelle	29/04/2015	ff/1/jim/29042015/ra	1	
Rosebelle	29/04/2015	ff/2/jim/29042015/ra	1	
Innocent	30/04/2015	ft/1/jim/30042015/im		1
Innocent	30/04/2015	ft/2/jim/30042015/im		1
Stephen	30/04/2015	ft/1/jim/30042015/sw		1
Stephen	30/04/2015	ft/2/jim/30042015/sw		1
Christopher	30/04/2015	ft/1/jim/30042015/cc		1
Christopher	30/04/2015	ft/2/jim/30042015/cc		1
Rosebelle	30/04/2015	ff/1/jim/30042015/ra	1	
Rosebelle	30/04/2015	ft/1/jim/30042015/ra		1
Innocent	01/05/2015	ft/1/jim/01052015/im		1
Innocent	01/05/2015	ft/2/jim/01052015/im		1
Stephen	01/05/2015	ft/1/jim/01052015/sw		1
Stephen	01/05/2015	ft/2/jim/01052015/sw		1
Christopher	01/05/2015	ft/1/jim/01052015/cc		1
Christopher	01/05/2015	ft/2/jim/01052015/cc		1
Rosebelle	01/05/2015	ft/1/jim/01052015/ra		1
Rosebelle	01/05/2015	ft/2/jim/01052015/ra		1
Innocent	02/05/2015	ft/1/jim/02052015/im		1
Innocent	02/05/2015	ff/1/jim/02052015/im	1	

Stephen	02/05/2015	ft/1/jim/02052015/sw		1
Stephen	02/05/2015	ff/1/jim/02052015/sw	1	
Christopher	02/05/2015	ft/1/jim/02052015/cc		1
Christopher	02/05/2015	ff/1/jim/02052015/cc	1	
Rosebelle	02/05/2015	ft/1/jim/02052015/ra		1
Rosebelle	02/05/2015	ft/2/jim/02052015/ra		1
Rosebelle	02/05/2015	ff/1/jim/02052015/ra	1	
Innocent	03/05/2015	ft/1/jim/03052015/im		1
Innocent	03/05/2015	ff/1/jim/03052015/im	1	
Stephen	03/05/2015	ff/1/jim/03052015/sw	1	
Stephen	03/05/2015	ff/2/jim/03052015/sw	1	
Christopher	03/05/2015	ft/1/jim/03052015/cc		1
Christopher	03/05/2015	ff/1/jim/03052015/cc	1	
Rosebelle	03/05/2015	ft/1/jim/03052015/ra		1
Rosebelle	03/05/2015	ff/1/jim/03052015/ra	1	
Innocent	04/05/2015	ff/1/jim/04052015/im	1	
Stephen	04/05/2015	ff/1/jim/04052015/sw	1	
Stephen	04/05/2015	ff/2/jim/04052015/sw	1	
Stephen	04/05/2015	ff/3/jim/04052015/sw	1	
Christopher	04/05/2015	ft/1/jim/04052015/cc		1
Christopher	04/05/2015	ft/2/jim/04052015/cc		1
Rosebelle	04/05/2015	ff/1/jim/04052015/ra	1	
Rosebelle	04/05/2015	ff/2/jim/04052015/ra	1	

4. VCA SURVEY IN MKWIRO

VCA survey for mixed reef fish and octopus in Mkwiro was done from 10/05/2015 to 17/05/2015. Jimbo B.M.U A comprehensive list of fishers and traders for both B.M.U members and non-members. was obtained from Mkwiro B.M.U officials. The sample size for fishers was obtained by populating and triangulating the full list of fishers while all the traders were sampled as they were very few.
The sample size for fishers was arrived at by using the formula below.

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size (e.g. total number of fishers engaged in Octopus fish) and e is the level of precision, in this case 0.05. This calculation is based on Yamane (1967).
After calculating the sample size for fishers, the respondents were randomly selected from the populated list while all traders were interviewed as they were only 5.

MKWIRO	**Fishers**	**Traders**
Population size	69	5
Sample size	59	5
Achievement	60	4

List of interviews conducted

Enumerator name	Date	Questionnaire ID	Fishers	fish Traders	
Stephen	10/05/2015	ff/1/mkw/10052015/sw	1		
Stephen	10/05/2015	ff/2/mkw/10052015/sw	1		
Rosebelle	10/05/2015	ff/1/mkw/10052015/ra	1		
Rosebelle	10/05/2015	ff/2/mkw/10052015/ra	1		
Innocent	10/05/2015	ff/1/mkw/10052015/im	1		
Innocent	10/05/2015	ff/2/mkw/10052015/im	1		
Christopher	10/05/2015	ft/1/mkw/10052015/cc			1
Christopher	10/05/2015	ff/1/mkw/10052015/cc	1		
Stephen	11/05/2015	ff/1/mkw/11052015/sw	1		
Stephen	11/05/2015	ff/2/mkw/11052015/sw	1		
Stephen	11/05/2015	ff/3/mkw/11052015/sw	1		
Rosebelle	11/05/2015	ff/1/mkw/11052015/ra	1		
Rosebelle	11/05/2015	ff/2/mkw/11052015/ra	1		
Innocent	11/05/2015	ff/1/mkw/11052015/im	1		
Innocent	11/05/2015	ff/2/mkw/11052015/im	1		
Innocent	11/05/2015	ff/3/mkw/11052015/im	1		
Christopher	11/05/2015	ff/1/mkw/11052015/cc	1		
Christopher	11/05/2015	ff/2/mkw/11052015/cc	1		
Christopher	11/05/2015	ff/3/mkw/11052015/cc	1		
Stephen	12/05/2015	ft/1/mkw/12052015/sw			1
Stephen	12/05/2015	ff/1/mkw/12052015/sw	1		
Stephen	12/05/2015	ff/2/mkw/12052015/sw	1		
Rosebelle	12/05/2015	ff/1/mkw/12052015/ra	1		
Rosebelle	12/05/2015	ff/2/mkw/12052015/ra	1		
Innocent	12/05/2015	ff/1/mkw/12052015/im	1		
Innocent	12/05/2015	ff/2/mkw/12052015/im	1		
Innocent	12/05/2015	ff/3/mkw/12052015/im	1		
Christopher	12/05/2015	ff/1/mkw/12052015/cc	1		
Christopher	12/05/2015	ff/2/mkw/12052015/cc	1		
Stephen	13/05/2015	ft/1/mkw/13052015/sw			1
Stephen	13/05/2015	ff/1/mkw/13052015/sw	1		
Rosebelle	13/05/2015	ff/1/mkw/13052015/ra	1		
Rosebelle	13/05/2015	ff/2/mkw/13052015/ra	1		
Innocent	13/05/2015	ff/1/mkw/13052015/im	1		
Innocent	13/05/2015	ff/2/mkw/13052015/im	1		
Christopher	13/05/2015	ff/1/mkw/13052015/cc	1		
Christopher	13/05/2015	ff/2/mkw/13052015/cc	1		
Stephen	14/05/2015	ff/1/mkw/14052015/sw	1		
Stephen	14/05/2015	ff/2/mkw/14052015/sw	1		
Innocent	14/05/2015	ff/1/mkw/14052015/im	1		
Innocent	14/05/2015	ff/2/mkw/14052015/im	1		
Christopher	14/05/2015	ff/1/mkw/14052015/cc	1		
Christopher	14/05/2015	ff/2/mkw/14052015/cc	1		
Christopher	14/05/2015	ff/3/mkw/14052015/cc	1		

Rosebelle	15/05/2015	ff/1/mkw/15052015/ra	1	
Rosebelle	15/05/2015	ff/2/mkw/15052015/ra	1	
Innocent	15/05/2015	ff/1/mkw/15052015/im	1	
Innocent	15/05/2015	ff/2/mkw/15052015/im	1	
Christopher	15/05/2015	ff/1/mkw/15052015/cc	1	
Christopher	15/05/2015	ff/2/mkw/15052015/cc	1	
Christopher	15/05/2015	ff/3/mkw/15052015/cc	1	
Stephen	16/05/2015	ff/1/mkw/16052015/sw	1	
Stephen	16/05/2015	ff/2/mkw/16052015/sw	1	
Rosebelle	16/05/2015	ff/1/mkw/16052015/ra	1	
Rosebelle	16/05/2015	ff/2/mkw/16052015/ra	1	
Innocent	16/05/2015	ff/1/mkw/16052015/im	1	
Innocent	16/05/2015	ff/2/mkw/16052015/im	1	
Christopher	16/05/2015	ff/1/mkw/16052015/cc	1	
Christopher	16/05/2015	ff/2/mkw/16052015/cc	1	
Rosebelle	17/05/2015	ff/1/mkw/17052015/ra	1	
Rosebelle	17/05/2015	ff/2/mkw/17052015/ra	1	
Stephen	17/05/2015	ff/1/mkw/17052015/sw	1	
Stephen	17/05/2015	ff/2/mkw/17052015/sw	1	
Stephen	17/05/2015	ft/1/mkw/17052015/sw		1

4. VCA SURVEY IN SHIMONI

VCA survey for mixed reef fish and octopus was done from 18/05/2015 to 31/05/2015. Population size of fishers and traders for both B.M.U members and non-members was obtained from Shimoni B.M.U officials by giving full list of actors. The sample size for fishers and small scale traders (mama karangas and wachuuzi) was obtained by populating and triangulating the full lists of each category actors while all large scale trader and octopus Agents were sampled as they were very few.

The sample size was arrived at by calculating a proportion of the population size using the formula below.

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size (e.g. total number of fishers engaged in Octopus fish) and e is the level of precision, in this case 0.05. This calculation is based on Yamane (1967).

After calculating the sample size for fishers and traders, the respondents were randomly selected from the populated list.

SHIMONI	**Fishers**	**Traders**
Population size	136	31
Sample size	101	29
Achievement	101	29

List of interviews conducted

Enumerator name	Date	Questionnaire ID	Fishers	fish Traders	
Christopher	18/05/2015	ff/1/shi/18052015/cc	1		
Christopher	18/05/2015	ff/2/shi/18052015/cc	1		
Christopher	18/05/2015	ft/1/shi/18052015/cc			1
Innocent	18/05/2015	ff/1/shi/18052015/im	1		
Innocent	18/05/2015	ff/2/shi/18052015/im	1		
Innocent	18/05/2015	ft/1/shi/18052015/im			1
Rosebelle	18/05/2015	ff/1/shi/18052015/ra	1		
Stephen	18/05/2015	ff/1/shi/18052015/sw	1		
Stephen	18/05/2015	ff/2/shi/18052015/sw	1		
Christopher	19/05/2015	ff/1/shi/19052015/cc	1		
Christopher	19/05/2015	ff/2/shi/19052015/cc	1		
Christopher	19/05/2015	ff/3/shi/19052015/cc	1		
Innocent	19/05/2015	ff/1/shi/19052015/im	1		
Innocent	19/05/2015	ff/2/shi/19052015/im	1		
Rosebelle	19/05/2015	ff/1/shi/19052015/ra	1		
Rosebelle	19/05/2015	ff/2/shi/19052015/ra	1		
Stephen	19/05/2015	ff/1/shi/19052015/sw	1		
Stephen	19/05/2015	ff/2/shi/19052015/sw	1		
Stephen	19/05/2015	ff/3/shi/19052015/sw	1		
Christopher	20/05/2015	ff/1/shi/20052015/cc	1		
Christopher	20/05/2015	ff/2/shi/20052015/cc	1		
Christopher	20/05/2015	ft/1/shi/20052015/cc			1
Innocent	20/05/2015	ft/1/shi/20052015/im			1
Innocent	20/05/2015	ft/2/shi/20052015/im			1
Rosebelle	20/05/2015	ff/1/shi/20052015/ra	1		
Rosebelle	20/05/2015	ff/2/shi/20052015/ra	1		
Stephen	20/05/2015	ff/1/shi/20052015/sw	1		
Stephen	20/05/2015	ff/2/shi/20052015/sw	1		
Christopher	21/05/2015	ff/1/shi/21052015/cc	1		
Christopher	21/05/2015	ft/1/shi/21052015/cc			1
Innocent	21/05/2015	ff/1/shi/21052015/im	1		
Innocent	21/05/2015	ff/2/shi/21052015/im	1		
Rosebelle	21/05/2015	ff/1/shi/21052015/ra	1		
Rosebelle	21/05/2015	ff/2/shi/21052015/ra	1		
Stephen	21/05/2015	ff/1/shi/21052015/sw	1		
Stephen	21/05/2015	ff/2/shi/21052015/sw	1		
Stephen	21/05/2015	ft/1/shi/21052015/sw			1
Christopher	22/05/2015	ff/1/shi/22052015/cc	1		
Christopher	22/05/2015	ff/2/shi/22052015/cc	1		
Christopher	22/05/2015	ft/1/shi/22052015/cc			1
Innocent	22/05/2015	ff/1/shi/22052015/im	1		
Innocent	22/05/2015	ff/2/shi/22052015/im	1		
Rosebelle	22/05/2015	ff/1/shi/22052015/ra	1		

Rosebelle	22/05/2015	ff/2/shi/22052015/ra	1	
Rosebelle	22/05/2015	ft/1/shi/22052015/ra		1
Stephen	22/05/2015	ff/1/shi/22052015/sw	1	
Stephen	22/05/2015	ff/2/shi/22052015/sw	1	
Stephen	22/05/2015	ft/1/shi/22052015/sw		1
Christopher	23/05/2015	ff/1/shi/23052015/cc	1	
Christopher	23/05/2015	ff/2/shi/23052015/cc	1	
Christopher	23/05/2015	ff/3/shi/23052015/cc	1	
Innocent	23/05/2015	ff/1/shi/23052015/im	1	
Innocent	23/05/2015	ff/2/shi/23052015/im	1	
Rosebelle	23/05/2015	ff/1/shi/23052015/ra	1	
Rosebelle	23/05/2015	ff/2/shi/23052015/ra	1	
Rosebelle	23/05/2015	ft/1/shi/23052015/ra		1
Stephen	23/05/2015	ff/1/shi/23052015/sw	1	
Stephen	23/05/2015	ff/2/shi/23052015/sw	1	
Stephen	23/05/2015	ff/3/shi/23052015/sw	1	
Christopher	25/05/2015	ff/1/shi/25052015/cc	1	
Christopher	25/05/2015	ff/2/shi/25052015/cc	1	
Christopher	25/05/2015	ft/1/shi/25052015/cc		1
Innocent	25/05/2015	ff/1/shi/25052015/im	1	
Innocent	25/05/2015	ff/2/shi/25052015/im	1	
Rosebelle	25/05/2015	ff/1/shi/25052015/ra	1	
Rosebelle	25/05/2015	ff/2/shi/25052015/ra	1	
Rosebelle	25/05/2015	ft/1/shi/25052015/ra		1
Stephen	25/05/2015	ff/1/shi/25052015/sw	1	
Stephen	25/05/2015	ff/2/shi/25052015/sw	1	
Stephen	25/05/2015	ft/1/shi/25052015/sw		1
Christopher	26/05/2015	ff/1/shi/26052015/cc	1	
Christopher	26/05/2015	ff/2/shi/26052015/cc	1	
Christopher	26/05/2015	ft/1/shi/26052015/cc		1
Innocent	26/05/2015	ff/1/shi/26052015/im	1	
Innocent	26/05/2015	ff/2/shi/26052015/im	1	
Innocent	26/05/2015	ft/1/shi/26052015/im		1
Rosebelle	26/05/2015	ff/1/shi/26052015/ra	1	
Rosebelle	26/05/2015	ff/2/shi/26052015/ra	1	
Rosebelle	26/05/2015	ft/1/shi/26052015/ra		1
Stephen	26/05/2015	ff/1/shi/26052015/sw	1	
Stephen	26/05/2015	ff/2/shi/26052015/sw	1	
Stephen	26/05/2015	ft/1/shi/26052015/sw		1
Christopher	27/05/2015	ff/1/shi/27052015/cc	1	
Christopher	27/05/2015	ff/2/shi/27052015/cc	1	
Christopher	27/05/2015	ft/1/shi/27052015/cc		1
Innocent	27/05/2015	ff/1/shi/27052015/im	1	
Innocent	27/05/2015	ff/2/shi/27052015/im	1	
Innocent	27/05/2015	ff/3/shi/27052015/im	1	
Rosebelle	27/05/2015	ff/1/shi/27052015/ra	1	
Rosebelle	27/05/2015	ff/2/shi/27052015/ra	1	

Rosebelle	27/05/2015	ft/1/shi/27052015/ra		1
Stephen	27/05/2015	ff/1/shi/27052015/sw	1	
Stephen	27/05/2015	ff/2/shi/27052015/sw	1	
Christopher	28/05/2015	ff/1/shi/28052015/cc	1	
Christopher	28/05/2015	ff/2/shi/28052015/cc	1	
Christopher	28/05/2015	ft/1/shi/28052015/cc		1
Innocent	28/05/2015	ff/1/shi/28052015/im	1	
Innocent	28/05/2015	ft/1/shi/28052015/im		1
Rosebelle	28/05/2015	ff/1/shi/28052015/ra	1	
Rosebelle	28/05/2015	ff/2/shi/28052015/ra	1	
Stephen	28/05/2015	ff/1/shi/28052015/sw	1	
Stephen	28/05/2015	ff/2/shi/28052015/sw	1	
Christopher	29/05/2015	ff/1/shi/29052015/cc	1	
Christopher	29/05/2015	ff/2/shi/29052015/cc	1	
Innocent	29/05/2015	ff/1/shi/29052015/im	1	
Innocent	29/05/2015	ff/2/shi/29052015/im	1	
Innocent	29/05/2015	ff/3/shi/29052015/im	1	
Rosebelle	29/05/2015	ff/1/shi/29052015/ra	1	
Rosebelle	29/05/2015	ft/1/shi/29052015/ra		1
Rosebelle	29/05/2015	ft/2/shi/29052015/ra		1
Stephen	29/05/2015	ff/1/shi/29052015/sw	1	
Stephen	29/05/2015	ff/2/shi/29052015/sw	1	
Stephen	29/05/2015	ff/3/shi/29052015/sw	1	
Christopher	30/05/2015	ff/1/shi/30052015/cc	1	
Christopher	30/05/2015	ft/1/shi/30052015/cc		1
Innocent	30/05/2015	ff/1/shi/30052015/im	1	
Innocent	30/05/2015	ff/2/shi/30052015/im	1	
Innocent	30/05/2015	ft/1/shi/30052015/im		1
Rosebelle	30/05/2015	ff/1/shi/30052015/ra	1	
Rosebelle	30/05/2015	ff/2/shi/30052015/ra	1	
Rosebelle	30/05/2015	ff/3/shi/30052015/ra	1	
Stephen	30/05/2015	ff/1/shi/30052015/sw	1	
Stephen	30/05/2015	ff/2/shi/30052015/sw	1	
Christopher	31/05/2015	ff/1/shi/31052015/cc	1	
Innocent	31/05/2015	ff/1/shi/31052015/im	1	
Innocent	31/05/2015	ft/1/shi/31052015/im		1
Innocent	31/05/2015	ft/2/shi/31052015/im		1
Rosebelle	31/05/2015	ff/1/shi/31052015/ra	1	
Rosebelle	31/05/2015	ff/2/shi/31052015/ra	1	
Rosebelle	31/05/2015	ft/1/shi/31052015/ra		1